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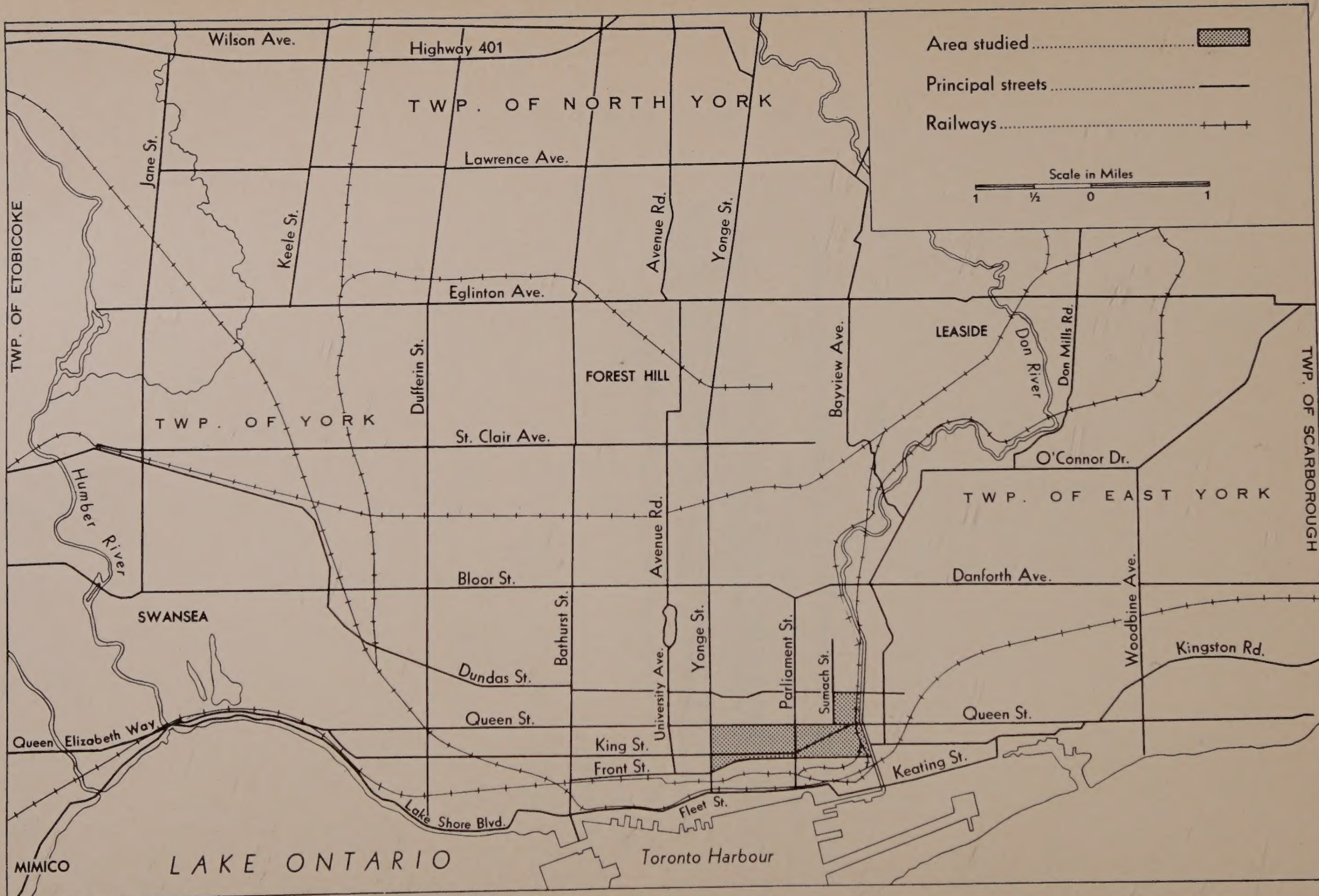

Figure 1. Location map.

MANUFACTURING IN DOWNTOWN TORONTO

*by Donald Kerr and Jacob Spelt**

The importance of Metropolitan Toronto in Canada's industrial complex is well known, but the functional significance of manufacturing in downtown Toronto has not before been fully examined. It has been assumed that the downtown area constituted a declining industrial district, an area of changing character and one with an uncertain future. However, numerous aspects of the internal structure of the manufacturing fabric need to be realised before an understanding of the essential role of the district can be reached.

Statistics compiled in the annual census of manufacturing for 1954 indicated that over four thousand firms in this metropolitan area, employing at least 200,000 persons, were producing almost one-fifth of the total Canadian industrial output. The census did not reveal, however, the areal differentiation of industry within the metropolitan district. It is towards an understanding of these variations that this study is directed.

The study deals with a small section of downtown Toronto, containing approximately 165 companies. No basic information was available and consequently it was necessary to contact each manufacturer in the area. This was done by interviewing representatives of the various firms with the aid of a questionnaire. Of the 158 firms contacted, 152 supplied information accurate and detailed enough to constitute working material for further analysis. The survey was completed in the summer of 1956 as part of the program of city and port studies being carried out by the Geographical Branch. The studies, in addition to being of use to the geographer, are of particular interest to economists, manufacturers, city planners, and civil defence authorities. The techniques used in the study are explained in the appendix which includes the questionnaire devised for this survey.

The Study Area

After an examination of the general land-use map of the city, one part of the downtown area was selected for intensive study. The boundaries chosen were—Yonge Street on the west, Queen and Dundas Streets on the

* Donald Kerr, Ph.D., Toronto and Jacob Spelt, Ph. D., Utrecht, are Assistant Professors of Geography, University of Toronto. This paper is part of a study of the urban geography of Toronto sponsored by the Geographical Branch.

north, Front Street on the south, and the Don River on the east (Figure 1). The area is level and roughly rectangular in shape, comprising approximately 310 acres and measuring 2,350 yards in an east-west direction.

South of this area lies a district largely devoted to manufacturing and warehousing in connection with the railways and the harbour. To the north and east across the Don River, lies a densely populated, predominantly residential district. Just north of Dundas Street and west of River Street, Regent Park, an extensive low-cost housing project has replaced a former slum. Part of the central business district is found within the study area on the west.

The area is well served by public transportation (Figure 2).* The subway runs along the western boundary under Yonge Street and stations are located at King and Queen Streets. King and Queen Streets have double track streetcar lines extending through the entire area. In a north-south direction buses run along Church and Sherbourne Streets, while Parliament Street has a streetcar line. Dundas Street also carries a streetcar line. Furthermore, these streets and other thoroughfares such as Jarvis and Shuter facilitate the movement of vehicles in the district. Railways serve only the extreme eastern and southeastern margins.

The Don Valley, forming the eastern boundary, is 25 to 40 feet below the general level. Railway tracks, a road, and a few manufacturing establishments are found in the valley, the slope of which is the only outstanding relief feature in the area. The river carries no traffic and is, at present, of no significance to the industries of the district.

Land use in the area is of great variety with many sharp contrasts. Apart from manufacturing plants, there are retail stores, wholesale establishments, row houses, railway yards, junk yards, hotels, schools, churches, and restaurants. With the exception of residences, very little grouping is apparent. It is not uncommon to see one-storey, shoddy retail stores, a well-kept wholesale establishment, an old multi-storey multi-purpose building, and a few dilapidated houses on one side of a street in one block.

Manufacturing is found in a great variety of buildings. Some firms are located in the basements of very old buildings; others on the upper floors of four- or five-storey buildings. In certain instances small firms have appropriated old houses. A few single-storey modern plants having a suburban aspect have replaced obsolete structures. In other cases companies have spent large sums of money on the renovation of their premises.

*Base maps for this figure were made available by the City of Toronto Planning Board.

Figure 2. Distribution of industry in the study area.

Manufacturing

Table 1 indicates the structure of manufacturing in the area. There are about 165 firms, 152 of which employ a total of 6,728 workers. Approximately one-third of the workers are females.

TABLE 1

Types of Manufacturing

Main Category	No. of Firms	Total Employment	Male	Female
Printing, etc.	35	1515	1122	393
Industrial machinery	10	839	725	114
Castings, metal pattern work	6	534	515	19
Food processing	12	483	315	168
Electrical appliances	4	331	243	88
Jewellery	13	325	175	150
Shoes, leather products	6	316	208	108
Home furniture, lampshades, picture frames	11	290	178	112
Clothing, textiles	5	297	70	227
Tool-die, metal stamping	8	181	167	14
Hospital equipment, medical supplies	4	161	104	57
Building materials, misc. building supplies	5	155	153	2
Ornamental and industrial plating	4	100	96	4
Paper boxes, containers	3	84	30	54
Waxes, soap and detergents	3	29	24	5
Others	23	1088	446	642
Total	152	6728	4571	2157

The total employment is spread over a large number of different types of manufacturing (Table 1). The most important is that group concerned with printing, lithography, typesetting, and publishing, employing 1,515 people representing 22.5 per cent of the total employment in the area. Many other types of manufacturing are represented, including industrial machinery, textiles, food processing, and furniture.

The industries vary greatly in size also, ranging from very small operations with fewer than 10 employees to a large firm employing 400 people (Table 2).

There is little pattern in the distribution as far as size is concerned. Smaller firms are more common on the fringe of the central business district, although even here some of the largest firms are located (Figure 3). Some buildings are occupied by several industries.

According to type of manufacturing, a similar lack of pattern is found, although this may be accounted for by the smallness of the area studied.

The only industries that display any significant clustering are the printing and jewellery trades, both of which are found close to the central business district.

TABLE 2

Size of Plants and Numbers Rented

Employees	No. of Plants	Percentage of Total Employment	Renting
1 — 9	43	3.3	38
10 — 24	43	10.0	23
25 — 49	27	13.4	12
50 — 99	21	19.3	6
100 — 199	9	18.0	2
200 and over	9	36.0	0
Total..................	152	100.0	81

More than half the firms, 81 out of the 152, rent their premises. It is difficult, however, to make a sharp distinction between owning and renting. When a firm rents the plant facilities from the president or a person closely associated with him, the building is considered to be owned. Only when the plant is rented from a company or person in no other way connected with the firm is it classified as being rented. As may be expected, the smaller firms show a greater tendency toward renting (Table 2).

A striking characteristic of the area as a whole is that a considerable number of companies have moved into the district recently: 66 firms located in the area since World War II; 22 came during the war; and 64 were in the area before the war. Some firms have been in the area since the 1870's. In many ways, therefore, it exhibits the characteristics of a vigorous and young industrial district.

FACTORS IN THE LOCATION OF INDUSTRY IN THE AREA

Despite the generally poor appearance of the district, most of the firms intend to remain. Of the 152 firms supplying information, 118 expressed the desire to stay in their present location; of the 34 firms planning to move, 15 will attempt to find another location in the downtown section of the city. Altogether, therefore, 133 of the 152 firms, or about 80 per cent, have definite preferences for location in the downtown area. These firms employ 5,591 persons or 83 per cent of the total employment in manufacturing in the area under study.

It was found that only 22 firms (14 per cent) of the 152 interviewed remained in the area due to what might be termed inertia. For these,

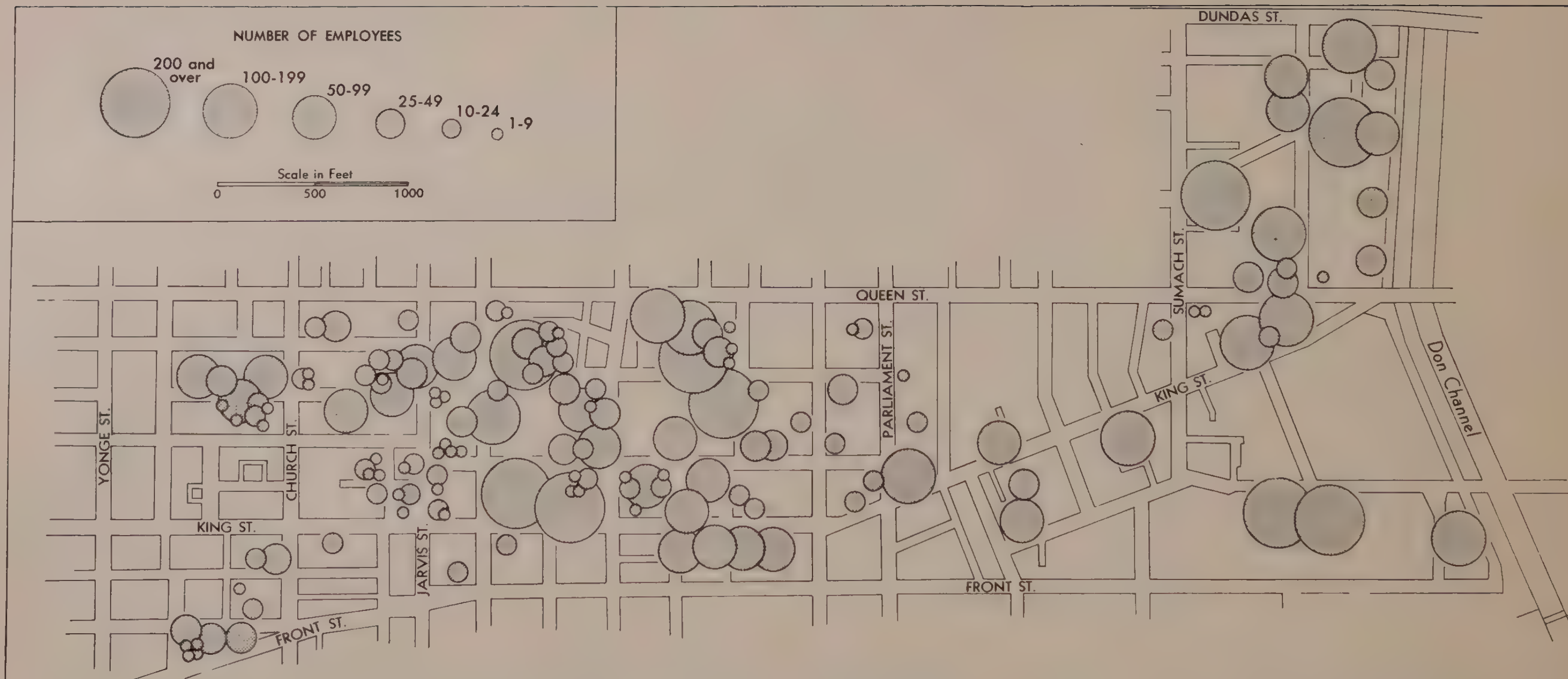

Figure 3. Distribution of firms according to the number of employees.

relocation though desirable was prohibitive for economic reasons such as the impracticability of interrupting manufacturing processes, the difficulty in realizing heavy capital investment, or the decline of business through poor management. Nearly all these firms had been in the area for many years, most of them owning their own premises.

Low rent forms the economic basis for some industries in the area. Old buildings no longer used for the purpose for which they were built offer low cost accommodation to small firms. Firms in this area do not have to maintain lunchroom facilities for their employees, in contrast with many companies in the suburbs. The area is dotted with small restaurants.

In some cases certain city by-laws are less restrictive than those in suburban areas; companies that have to pile materials such as lumber out of doors are favoured in this respect. Some firms make use of storage facilities available in downtown Toronto. When a special type of storage, such as cold storage, is required or when their own facilities are limited, the accessibility of storage space is important.

Several firms remain in the area because of the personal preferences of their owners who have a strong and long established attachment to the downtown area.

Finally, there are advantages from the point of view of transportation. Large companies using rail sidings claim that boxcars are more accessible in the downtown area than in other locations because shunting is done more frequently. Small firms report that the frequent pick-up and delivery services of the downtown area are of great value in their business.

Market

Of the 133 firms that stated a preference for location in the downtown area, 92 stressed a number of different aspects of the market factor as being of great importance.

The market may be found in the form of allied industries, where, for instance pattern makers work for nearby tool and die makers. Several small printing and publishing companies perform all kinds of printing, type-setting, lithography, and binding for other firms downtown. Of the 35 establishments in this category, 28 firms, employing 33 per cent of the workers in printing, publishing, and bookbinding have at least 90 per cent of their market in Toronto. An important market is found in the central business district where advertising agencies, business offices, and law firms frequently demand the services of local printers and publishers. The local market is less important for the larger plants of which three, employing

50 per cent of the total labour force in this category, sell less than 50 per cent of their products in Toronto.

Other firms consider the market in the downtown area in terms of local buyers such as department and chain stores. Over-the-counter sales and orders that must be filled on short notice are important for certain firms. Some of the upholstering firms and those making lamps and lampshades depend somewhat on this trade.

Many small to moderate sized firms that depend to a large extent on out-of-town buyers favour a downtown location. The typical customer will stay in a downtown hotel and transact most of his business in the central business district. Jewellers and manufacturers of home and institutional furnishings stressed this advantage, pointing out that the average out-of-town buyer disliked inconvenient and time-consuming trips to the suburbs.

Finally there is the aspect of centrality. Many firms, especially tool and die makers and manufacturers of machine parts, consider themselves strategically located with respect to customers in the city and the suburbs. From their downtown location they can easily fan out to serve their customers. According to the representatives of these firms, customers dislike travelling from one suburb to another, but are attracted downtown where other business affairs can be carried out.

Labour

The labour factor was much less emphasized than the market. Of the 133 firms with a distinct preference for a downtown location, only 39 mentioned labour as an important factor, although the use of low-cost, unskilled, female labour and unskilled labour in general was considered significant by the writers. The total female employment in the area amounts to 31 per cent of the total employment. However, of the 25 firms that stressed unskilled labour as an important factor in their present location, female labour made up 57 per cent of their total employment. In clothing and textile industries, female labour accounts for 72 per cent of the total labour force. Industries such as those manufacturing dolls, candies, and shoes also use a preponderance of female labour, most of which comes from close by and would not be available, according to the manufacturers, in suburban locations.

Those workers who do not live in the area can reach factories easily because of good public transportation facilities. Inquiry also disclosed that a downtown location is an advantage for plants operating night shifts.

Transportation facilities on King, Queen and Yonge Streets continue to run throughout the night, while services on other streets are discontinued.

Firms in the downtown area have little difficulty in enlisting labour quickly; absentees can be replaced the same day, and costly delays and interruption in the manufacturing process may be avoided. Some firms rely heavily on recently arrived immigrant labour living nearby. Of the 150 persons employed by one firm, 60 per cent were New Canadians.

Firms in the downtown area can obtain office help easier than their counterparts in the suburbs; the accessibility of downtown stores during the lunch hour is appealing to many women.

Of the 39 firms emphasizing the labour factor, 13, principally jewellers, printers, and makers of machine parts, stressed the importance of skilled labour. Such workers may come from all over Metropolitan Toronto and in some instances companies are reluctant to move to a suburb because they might lose valuable employees.

Materials

Very few manufacturing plants in the area use basic raw materials. Most firms purchase secondary materials such as steel, plastics, or plywood, etc., for further fabrication and at least 60 per cent purchase over half of their supplies from wholesalers in Metropolitan Toronto. Small firms in particular, with limited storage space, depend on nearby warehouses for steady and rapid delivery. Moreover, small firms often lack investment capital to stockpile materials, especially when these are of a great variety, or are used in small amounts intermittently. Spare parts for machines also can be obtained rapidly in the downtown area, eliminating delays in production resulting from failure of equipment. Few manufacturers, however, stressed the factor of materials as a dominant one in the choice of their location, but undoubtedly the accessibility of a large number of wholesalers is advantageous.

Metropolitan Toronto comprises a tremendous storehouse of industrial materials. Almost any spare part or unusual hardware supply can be delivered to any section of the city within a day. The downtown area in particular is well served and one firm employing over 70 people mentioned specifically the fact that rare and uncommon parts such as certain types of screws may readily be obtained in the downtown area.

Locational Disadvantages

From the investigation it was discovered that 34 of the 152 firms interviewed considered their present site no longer economic and were making or had made plans to move.

Obsolescence of buildings is one of the most important reasons for moving. Twenty of the 34 firms intending to move stated it as one of their reasons. Many structures are old and dilapidated, and were originally built for other purposes; they have undergone numerous alterations without, however, attaining the standards required by modern manufacturing processes. The emphasis on efficient plant lay-out and one-floor operations has been increasing and old buildings have become unsuitable. Although not all the buildings are weak structurally, it is a case of multistorey operations being unsatisfactory in terms of more handling of goods, more walking through the plant, and more difficult supervision of workers, than in a single-storey operation.

Most frequently cited as a disadvantage was lack of space for expansion. Of the 34 firms, 27 pointed out that this was one of the factors that made it necessary for them to move. In such cases, no space is available for new additions and high land values make the acquisition of adjacent properties virtually impossible. Among the firms moving for this reason are some large plants employing between 100 and 400 employees.

Sixteen firms of the 34 gave congestion as one of the reasons for moving. In some cases this meant a lack of parking space; in other instances difficult accessibility. When narrow lanes are used by more than one firm, the loading platforms are difficult to reach. Streets and sidewalks are often blocked when long trucks are backed up against front entrances of buildings, and interfere with the general flow of traffic.

However, about 100 of the 152 firms interviewed considered accessibility for trucks good to excellent. Perhaps this might be explained partly because delivery problems do not concern the manufacturer, and partly because many manufacturers employ trucking firms for shipping their products, and consequently have little direct experience with the high cost of lost time due to crowded traffic conditions.

In three cases firms wish to move in order to concentrate their manufacturing processes. Various operations are carried out in separate buildings in different parts of the city and they wish to move the entire production into one building.

Nine firms showed concern about by-laws and related difficulties. Some have special problems with waste products. The disposal of waste may involve extra cost because trucking firms demand special containers; difficulties arise with building codes such as refusal to allow the installation of better loading and unloading facilities, etc.

Of the 34 firms intending to move only 19 plan to leave the downtown area of the city. Eighteen will set up operations in the suburbs of Toronto and one will move to another town. Total employees affected is 1,137, more than half of whom are in three firms.

In general, problems such as lack of space for expansion, obsolete buildings, and congestion confront these companies in varying degrees, and force them away from the downtown area. Eleven of the 19 indicated that the Metropolitan Toronto market constituted less than 50 per cent of their business. Five firms are leaving downtown because they need rail sidings. The remainder are moving to the suburbs for personal reasons, and are the counterpart of those who like the downtown area for personal reasons.

Locational Advantages

By and large the downtown area of a large city offers many attractions to a small, newly formed company. A firm beginning on a small scale with limited financial resources can find the desired space at relatively low cost in one of the old buildings without too much difficulty. If the company begins to grow, additional quarters are required which may or may not be available. Occasionally there is an intensive struggle for floor space in an old multi-storey building. Gradually the more energetic, more successful company will appropriate an increasing number of rooms as rivals fail or move out, although it was discovered that certain small companies restrict expansion and set a limit upon growth commensurate with the size of their rented premises.

The availability of all types of labour in the downtown area favours the development of small industries, and a downtown location of the National Employment Services facilitates the hiring of casual labour on a day-to-day basis.

Perhaps the most important factor to a new firm is being in "the centre of things". Potential customers can be contacted more easily than in other areas. In certain cases the small company can maintain a modest showroom on its premises, the separation of which from a suburban factory would be too costly. Furthermore, a great variety of materials can be purchased from the host of suppliers in the downtown area.

CONCLUSIONS

A study of manufacturing in a relatively small area in downtown Toronto brings to light factors that support the maintenance of industry on one hand and cause its flight to the suburbs on the other. Most of the

manufacturers interviewed expressed a desire to remain in the downtown region. In many cases the downtown market was the most significant factor. In others, cheap labour formed the economic basis. Less than 25 per cent were planning to move out of the area, and in these cases lack of space for expansion and obsolete buildings were the most serious problems.

On the surface the area appears as an old and declining industrial district, but the fact is, that while there are a number of stagnant firms scattered throughout the area, behind this facade there is a surprisingly strong growth of youth and vigour.

Appendix

The method used in a study of this type is important, as many industrial studies have been based on questionnaires circulated by mail, some of which are returned only partially answered. Many manufacturers stated to the writers that they would be inclined to ignore a mailed questionnaire. Furthermore, those who had completed mailed questionnaires in the past complained that questions are often open to various interpretations. Mailed questionnaires may often be filled out by assistants and the figures returned tend to be rough estimates. In the opinion of the writers a complete coverage can only be obtained by work in the field.

In a personal interview not only the valuable and accurate statistical material is gathered, but also the views and opinions of the manufacturer concerning the industrial area. The whole purpose of the research can be explained and this often arouses a genuine interest on the part of the company representative. In addition, the character and personality of the industrial area can best be absorbed by the researcher as he moves about from factory to factory day after day.

The position held by the representative contacted can vary, but it was found that in small and medium-sized companies the president or general manager was the best person to interview. In larger companies the production manager, sales manager, or accountant proved to be good contacts.

It was not found advisable to arrange for appointments ahead of time, spontaneous, unprepared interviews being the most rewarding. Only rarely was it found that preparation was needed by the representative to answer questions about his firm.

In general, no confidential information was required in order to carry out the study. As far as possible, questions were phrased in such a way that they did not pry into the secrets of the company. Absolute figures,

except in the case of employment, were not sought, other values being recorded on a percentage basis.

The layout of the questionnaire was prepared in such a way that most of the data could be processed in IBM computers.

MANUFACTURING QUESTIONNAIRE

D.B.S. Classification..................

I. Name of Company..
Address..
Representative interviewed..
Position..Telephone.....................
Owning.................... Renting................

II. *Products*	Percentage of value of production
a.	a. ....
b.	b. ....
c.	c. ....
d.	d. ....
e.	e. ....

III. *Location*

A. When established in this location?

postwar	....	twenties	....
during World War II	....	World War I	....
thirties	....	before World War I	....

Previous Location(s)..

....

B. *Labour*

a. Average Total employment..
b. Average female employment..

C. *Market*

Market Areas	Specific Areas	% of total sales
Metropolitan Toronto	....	....
Rest of southern Ontario	....	....
Rest of eastern Canada	....	....
Western Canada	....	....
Coast to coast	....	....
Others	....	....

D. *Materials* % on the basis of value

a. From distributors........................... ....

Location of distributors..

% on the basis of value

b. Direct from factory......................... ....

Location of factories..

IV. *Future Developments*

Do you intend to stay in this location? Yes............... No...............

(If yes, see IVA; if no, see IVB)

A. *Stay*

What attracted you to this site and/or what are some of the factors in the location of your plant in this area?

a. Vacant building Yes............. No.............

b. Market Yes............. No.............

c. Labour: (i) skilled Yes............. No.............

(ii) unskilled Yes............. No.............

(iii) female Yes............. No.............

d. Materials..

e. Transportation

Railsiding Yes............. No.............

Regularly used...... Yes............. No.............

for materials Yes............. No.............

for products Yes............. No.............

Percentage in total volume of materials....................................

Percentage in total volume of products.......................................

Accessibility for trucks: good........... fair........... poor...........

Accessibility for workers: good............. fair............. poor......

f. Other factors in transportation..

g. Other reasons why you wish to stay here.....................................

h. Do you intend to

renovate, rebuild, or expand Yes............. No.............

expand elsewhere Yes............. No.............

if so, where..

i. Does your location have any advantages or disadvantages compared with your major competitors?

	Ad.	Disad.
(*a*) *Geographical location*		
Market	....	....
Labour	....	....
Materials	....	....
Taxes or rent	....	....
By-laws (specify)	....	....
....		

	Ad.	Disad.
(*b*) *Site*		
Plant facilities	....	....
Accessibility, loading facilities, etc.	....	....

(*c*) Others..

j. Inertia Yes........... No...........

k. Additional Remarks..

B. *Move*

Why do you wish to move?	Yes	No
a. Obsolete building	....	....
b. Lack of space for expansion	....	....
c. Rising land values	....	....
d. Congestion or inaccessibility		
trucks	....	....
workers	....	....
rail siding required	....	....
e. Labour rates	....	....
f. Concentration of manufacturing process	....	....
g. By-laws (specify)		
parking	....	....
taxes	....	....
waste disposal	....	....
zoning	....	....
building regulations	....	....

h. Additional Remarks..

Where do you plan to move?

Metropolitan Toronto? Yes.............

Preference for any part of the city? Yes.............

if so, where?..

Southern Ontario? Yes.............

if so, where?..

Others? Yes.............

if so, where?..

Preference for new location? (specify)

a. Market..

b. Labour..

c. Materials..

d. Taxes or rent..

e. By-laws..

f. Plant facilities..

g. Others..

RÉSUMÉ

Au cours de l'été de 1956, les auteurs de cet article ont fait un relevé d'un secteur industriel de la "basse ville" de Toronto afin d'en étudier les particularités: facteurs de localisation, activités, nature et conditions de travail, perspectives d'avenir.

Aucune donnée statistique n'était disponible et il leur a fallu se mettre en contact avec les dirigeants de chacun des 158 établissements situés dans le secteur; le questionnaire en appendice de l'article servit à obtenir les renseignements désirés.

Bien que ce secteur ait l'apparence générale d'être fortement en baisse, l'enquête a révélé que la plupart des établissements se proposent d'y demeurer. Les principales raisons sont le loyer modique, l'accessibilité des marchés et la disponibilité de la main-d'oeuvre. De plus, vu que la majorité des industries sont relativement petites et que la plupart utilisent des matières partiellement ouvrées, leurs sources d'approvisionnement sont surtout les marchands de gros situés à proximité. La grande partie de la main-d'oeuvre réside dans les quartiers voisins et la région métropolitaine de Toronto constitue un marché où s'écoulent presque tous les produits fabriqués dans le secteur étudié.

Dans la conclusion, les auteurs font remarquer que, malgré l'aspect vieillot et dégradé donné au quartier par les constructions et quelques entreprises en décadence, l'industrie en réalité y est active et semble bien vouloir y demeurer.

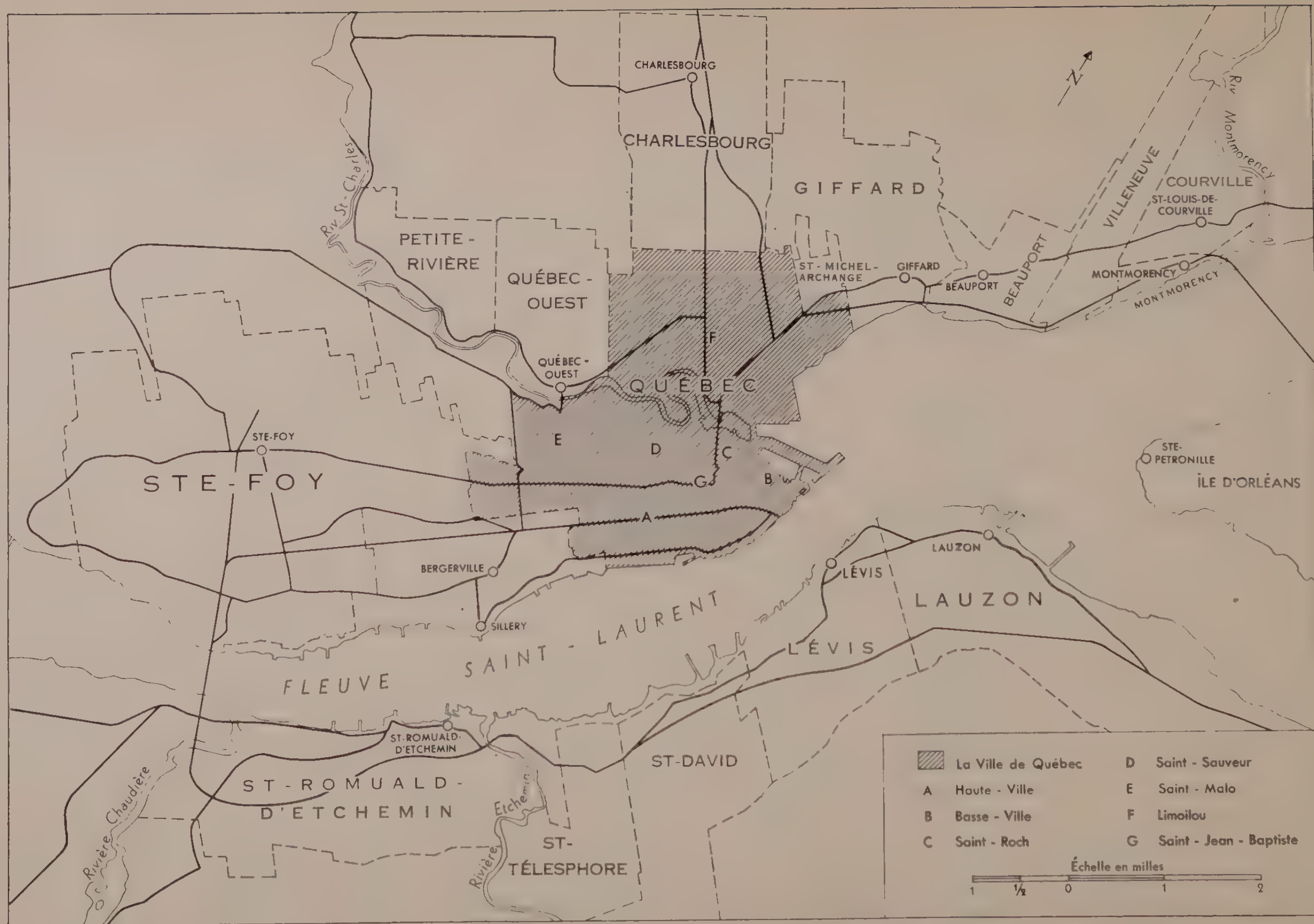

Figure 1. *Carte-index des municipalités de la région de Québec (Québec et sa banlieue immédiate) et des principaux quartiers de la ville de Québec.*

LE PAYSAGE URBAIN DE QUÉBEC[1]

Pierre Camu

INTRODUCTION

Les villes sont des milieux géographiques complexes qu'il n'est pas toujours facile de définir rigoureusement. Chose certaine, l'étude géographique des villes suggère plusieurs types d'enquête. On a déjà écrit qu'il y a ville "toutes les fois que la majorité des habitants passe la plus longue partie de son existence et dépense la part principale de son activité à l'intérieur même de l'agglomération"[2]. Cette définition des villes en fonction du genre de vie apparaît insuffisante. Le géographe Max Sorre nous semble serrer de plus près la réalité en insistant davantage sur l'apparence extérieure et les fonctions des villes. N'écrit-il pas qu'une ville est une "agglomération fermée, permanente, plus ou moins considérable et dense, en grande partie ou totalement indépendante de son terroir pour sa subsistance, impliquant une vie de relations active et traduisant dans son aspect général un haut degré d'organisation"[3]. Cette seconde définition se rapproche davantage de ce que nous cherchons à décrire dans cet article.

Ce qui nous intéresse, en effet, ce sont les traits apparents et distinctifs d'une région urbaine, son aspect extérieur, ses caractères physiques, "photographiables", c'est-à-dire la masse, composée de vides et de pleins, de parcs, d'espaces verts, de rues et de "blocs" ou pâtés de maisons. Nous essaierons donc de décrire le paysage urbain d'après les trois dimensions de l'espace et nous ajouterons quelques notes sur la densité des espaces construits et sur l'utilisation du sol.

La région étudiée est délimitée dans la figure 1 ; elle couvre une superficie d'environ 25 milles carrés et tient compte uniquement de la surface bâtie de façon continue. Cette région se divise en deux zones, la zone urbaine proprement dite et la zone suburbaine de Québec.[4] D'autres auteurs désignent la région suburbaine du nom de "banlieue immédiate", c'est-à-dire, "comme son nom l'indique, le territoire contigu à la ville,

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[1] Ce travail est le résultat partiel d'une enquête faite en 1955 dans la région métropolitaine de Québec par une équipe de la Division de la géographie du ministère des Mines et des Relevés techniques, équipe dirigée par l'auteur.

[2] J. Brunhes et P. Deffontaines: Géographie humaine de la France; tome II, p. 80.

[3] M. Sorre: Les Fondements de la géographie humaine, L'Habitat, Conclusion générale; tome III, p. 180.

[4] "On applique en effet à la zone périphérique d'une grande ville diverses appellations. Certains auteurs distinguent d'une part, la zone suburbaine, d'autre part, les localités-satellites. La première comprend la zone habitée de façon continue autour de la ville et dans laquelle on passe sans s'en rendre compte. Elle peut inclure plusieurs entités administratives officielles distinctes." J.-C. Falardeau: "Délimitation d'une banlieue de grande ville"; Rev. Can. d'Urbanisme, vol. 1, nº 1, février 1951, p. 17.

construit de façon continue et dont la population est d'une densité relativement semblable à celle de la ville"[1]. La densité de population au mille carré dans la région étudiée est de 10,000 habitants. Pour fins de compilation des données statistiques cependant, nous avons groupé dix-sept municipalités, dont la superficie est de 64 milles carrés avec une population de 250,226 habitants en 1951, soit une densité de 3,990 personnes au mille carré. Les dix-sept municipalités sont: Québec, Sillery, Sainte-Foy, Québec-Ouest, Petite-Rivière, Charlesbourg, Saint-Michel-Archange, Giffard, Beauport, Villeneuve, Courville, Montmorency, Lauzon, Lévis, Saint-David, Saint-Télesphore et Saint-Romuald. La région métropolitaine de Québec, telle que délimitée pour les fins du Recensement de 1951 et celui de juillet 1956, couvre un territoire encore plus grand puisqu'il comprend trente municipalités avec une population totale de 274,827 habitants en 1951, et d'environ 300,000 en 1956.

LES GRANDS TRAITS TOPOGRAPHIQUES

R. Blanchard, J.-M. Roy et C. Brown ont déjà étudié en détail la situation et le site de Québec.[2]

Deux traits topographiques principaux, le fleuve Saint-Laurent et la colline de Québec, influencent directement le paysage urbain.

Le fleuve partage la région en deux sous-régions: celle de la rive droite qui groupe cinq municipalités et celle de la rive gauche qui en compte douze. La colline de Québec s'élève à une hauteur moyenne de 250 pieds et étage la zone construite en ville haute et en ville basse. La rivière Saint-Charles elle-même sépare la ville basse en deux unités, d'une part Limoilou et les municipalités voisines, d'autre part les quartiers de la Basse-Ville, Saint-Roch et Saint-Sauveur en particulier. Même sur la rive droite, on retrouve des quartiers en haut et en bas de la falaise. En général, la zone construite s'étire dans des directions bien définies, épousant les formes du relief, dans Sainte-Foy, vers le sud-ouest surtout dans la dépression de Cap-Rouge, dans Limoilou, et vers le nord-est sur la côte de Beaupré.

L'EXPANSION TERRITORIALE

Nous avons cartographié l'expansion territoriale de la région de Québec à la fin de périodes significatives de son histoire et nous avons mesuré aussi son étendue en milles carrés (Figure 2):[3]

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[1] *Ibid.*, p. 17.

[2] R. Blanchard: "Québec, esquisse de géographie urbaine"; dans *L'Est du Canada Français*, Tome II, pages 159 à 292. J.-M. Roy: "Québec, esquisse de géographie urbaine"; dans *Le Géographe Canadien*, n° 2, 1952, pages 83 à 98. C. Brown: Québec, Croissance d'une ville; Québec, 78 pages.

[3] En calculant la superficie en milles carrés, nous n'avons pas tenu compte de la ferme ou de la maison isolée, mais de l'ensemble construit d'une façon continue et contiguë.

Figure 2. Expansion territoriale de la région de Québec de 1608 à nos jours, à la fin de périodes déterminées.

Année 1690	0.16	mille carré
1759	0.32	" "
1830	1.63	" "
1867	3.06	milles carrés
1920	8.5	" "
1944	11.3	" "
1955	25.0	" "

A la fin du régime français (1759), la ville occupait encore une surface réduite, soit 0.32 mille carré, répartie dans la partie haute et la partie basse. Charlesbourg et Beauport existaient déjà comme noyaux de peuplement séparés. Au cours des cent années suivantes, la surface bâtie s'étend vers l'ouest, en haut et en bas de la falaise nord, et au pied du cap Diamant. Un ruban urbain sur la rive sud se dessine déjà. Après 1867-1870 et jusqu'à la Première Guerre mondiale, on constate une poussée urbaine du côté nord de la rivière Saint-Charles, l'apparition de Limoilou, la création du parc des Champs de Batailles, l'expansion de la ville haute vers le sud-ouest, la formation plus distincte du ruban urbain sur la rive sud, enfin l'expansion de Beauport à Montmorency. Dans la période de l'entre-deux-guerres, l'ensemble urbain continue de faire tache d'huile. Remarquons la création de Québec-Ouest, l'expansion de Charlesbourg, Limoilou, Sillery et Saint-Malo. On construit peu sur la rive droite à ce moment-là. Depuis la Seconde Guerre mondiale, le territoire urbain s'étend dans toutes les directions, en particulier vers le sud-ouest, dans la zone Limoilou-Montmorency le long de la route de Charlesbourg et, sur la rive sud, dans les villes de Lauzon, Lévis et Saint-Romuald. C'est la plus grande expansion de la surface bâtie dans toute l'histoire du grand Québec.[1]

Nous avons donc aujourd'hui un ensemble urbain de plus de 25 milles carrés, construit sans interruption à partir d'un centre qui est la "cité", à l'intérieur des murs et des fortifications. Les principales artères sont, dans la ville haute: l'axe du chemin Saint-Louis–Grande-Allée–boulevard Laurier, le chemin Sainte-Foy et la rue Saint-Jean; dans la ville basse: la route de Montréal et la rue Saint-Vallier, la route de Charlesbourg et des Laurentides, l'avenue Royale et le boulevard Sainte-Anne; enfin, sur la rive droite: la nouvelle route Transcanadienne.

LA DENSITÉ DE L'HABITAT URBAIN

"Plus intéressant que le plan même est la densité de chaque îlot, son taux d'éclairement, le quotient de la surface libre et des espaces verts par

[1] Des recoupages intéressants peuvent être faits avec les cartes reproduites dans l'étude de C. Brown, *op. cit.*, pour des années intermédiaires.

Figure 3. Vue aérienne du centre de Sillery, zone de faible densité de construction; moins de 20 p. 100 de la superficie est occupée par les toits dans un bloc. (Photo: ARC)

Figure 4. Vue aérienne des quartiers Saint-Roch, Saint-Sauveur et Saint-Jean-Baptiste, zones de forte densité de construction; plus de 60 p. 100 de la superficie est occupée par des toits dans un bloc. (Photo: ARC)

rapport à l'espace bâti"[1]. On a déterminé la densité de l'habitat urbain par "bloc" construit, d'après le pourcentage occupé par la surface en toits à l'intérieur du "bloc", comparé à la surface occupée par les jardins, les cours, les espaces libres, les allées et les ruelles. On s'est servi de photographies aériennes verticales pour préparer la carte de la figure 5. En examinant les figures 3 et 4, on remarque qu'un "bloc" du centre de la ville de Québec apparaît totalement construit; il n'y a pas d'espaces libres, si ce n'est une petite cour intérieure à l'arrière de chaque maison, tandis qu'un bloc de banlieue est ouvert, chaque maison isolée de la voisine par des pelouses ou des jardins. Le pourcentage de la surface occupée par des toits est élevé dans le premier cas, mais faible dans le second. Quatre catégories de pourcentages ont été établies, soit de 0 à 20 p. 100, de 20 à 40, de 40 à 60, et de 60 à 100. Les résultats sont donc approximatifs, car un bloc qui a un pourcentage de 38 ou 39 p. 100 sera classé dans la même catégorie que le bloc qui a un pourcentage de toits de 21 p. 100. Que faire dans le cas d'un bâtiment isolé au milieu d'un champ? D'un monastère situé dans Sainte-Foy par exemple? Si l'on tient compte du bâtiment seul, le pourcentage est de 100; si, au contraire, on délimite un bloc autour du bâtiment, la densité passe à 80 ou 60 p. 100. Nous avons adopté cette deuxième méthode pour les bâtiments isolés.

On remarque sur la carte (Figure 5) que, dans le centre de la région métropolitaine, l'habitat urbain est dense, que dans un pâté de maisons et de bâtiments il y a peu d'espaces non construits et, qu'en somme, les pourcentages sont élevés. La "cité", la partie à l'intérieur des remparts, est une exception. Les jardins du couvent des Ursulines, en particulier, et quelques autres cas du même genre contribuent à aérer le quartier. La densité est de 40 à 60 p. 100.

On distingue difficilement dans la région de Québec des zones concentriques avec des densités de plus en plus faibles à mesure qu'on s'éloigne du centre, car Québec s'est développé en longueur plutôt qu'en forme circulaire. Les parties les plus denses sont celles du quartier du port, d'une grande partie de la Basse-Ville, du quartier Saint-Jean-Baptiste et de Limoilou avec une densité de plus de 60 p. 100. La deuxième zone de densité (40-60 p. 100) comprend le quartier Montcalm, la partie ouest de Saint-Sauveur, le centre industriel de Saint-Malo, la partie centrale de Limoilou et la zone des réservoirs à pétrole le long du fleuve. La troisième zone de densité (20-40 p. 100) est située au delà de la précédente, dans la partie est de Sillery et la partie ouest de la ville de Québec, près du parc de

[1] P. George: La Ville. Le fait urbain à travers le monde, p. 17.

Figure 5. Densité de l'habitat urbain dans la région de Québec en 1955, d'après le pourcentage de la superficie occupée en toits dans un bloc.

l'Exposition, à Saint-Michel-Archange et à Giffard. Enfin, la zone la moins dense couvre toute la ville haute, à l'ouest de la rue Maguire, des îlots dans l'est de Sillery, une partie de Québec-Ouest, tout Charlesbourg, les quartiers les plus récents de Limoilou et presque toute la côte de Beaupré.

Sur la rive droite, les bâtiments sont plus espacés que sur la rive gauche. Le centre de Lévis ainsi que les vieilles sections de Lauzon et de Saint-Romuald ont une densité de 20 à 40 p. 100; ailleurs la densité des espaces construits ne dépasse pas 20 p. 100.

Il n'est pas facile de déterminer le pourcentage de la surface libre par rapport à la surface bâtie. Nous l'avons fait dans le cas de municipalités dont le territoire est à peu près entièrement utilisé. La ville de Québec a 17 p. 100 de son territoire en espaces libres, soit en parcs, trottoirs et terrains non utilisés. Sillery a 9 p. 100 du sien. Ce sont là des villes passablement bien éclairées, mais ce qui compte c'est la localisation des espaces verts, la distribution des parcs et des terrains de jeux. Dans le paysage urbain de la rive gauche, les grands espaces verts sont situés en haut de la colline, face au fleuve, depuis la Citadelle jusqu'au pont de Québec, et, de l'autre côté de la colline, le long du chemin Ste-Foy. Les quartiers résidentiels sont ainsi coincés entre deux bandes de verdure. Dans la ville basse, à l'exception du parc Victoria et du terrain de l'Exposition, les maisons et autres bâtiments se coudoient, laissant peu de place au soleil et à l'air pur, là où l'on en aurait le plus besoin. C'est plus aéré et moins densément construit sur la rive droite.

LA HAUTEUR DES BÂTIMENTS

La caractéristique la plus frappante, celle qui distingue le mieux une agglomération urbaine d'une autre, c'est la hauteur des bâtiments (Figure 6). Ainsi, le Château Frontenac, l'édifice Price, l'usine de l'*Anglo Pulp*, la cheminée de l'usine des Ciments du Saint-Laurent, les grands hôpitaux (dont l'aile centrale de l'Hôtel-Dieu), les installations portuaires, les clochers d'église sont d'excellents points de repère; ils dépassent en hauteur la plupart des bâtiments qui les entourent (Figures 6 et 7). On a indiqué sur la carte la hauteur moyenne par "bloc", en pieds et non en étages.

Les zones de bâtiments élevés sont la Basse-Ville, la "cité" à l'intérieur des remparts et une série de blocs le long du boulevard Charest. Les édifices publics de toutes sortes, fort nombreux à Québec, ont presque tous plus de 40 pieds de haut. La masse des bâtiments cependant a une hauteur moyenne de 30 à 40 pieds; par exemple tout le quartier Saint-Roch, une très grande partie de Limoilou et le centre industriel de Saint-Malo. Enfin,

Figure 6. Quelques édifices modifient aisément un paysage; ainsi cette vue de Québec avec le Château Frontenac au centre, le bureau de poste et l'édifice Price à droite. A l'avant-plan, vue de la Basse-Ville.

Figure 7. Usine de l'Anglo Pulp: différentes hauteurs dans un même bloc.

Figure 8. Hauteur des bâtiments dans la région de Québec en 1955.

les sections les moins élevées comprennent les centres domiciliaires de Sillery, Sainte-Foy, Beauport et Giffard. La hauteur moyenne sur la rive droite varie entre 20 et 30 pieds.

L'ÂGE, LA COULEUR ET LE MATÉRIAU EXTÉRIEUR DES MAISONS ET BÂTIMENTS

Dans une ville comme Québec, fondée en 1608, l'âge des maisons et bâtiments varie beaucoup d'un quartier à l'autre. Dans certaines zones considérées comme de vieilles zones d'habitation, on a démoli et reconstruit. En général, la carte montrant l'expansion territoriale donne l'âge des bâtiments originaux (Figure 2). Dans les secteurs construits depuis une centaine d'années, l'âge moyen vaut pour l'ensemble des maisons et autres bâtiments.

La couleur et le matériau extérieur vont de pair. Le gris domine dans la Basse-Ville, le rouge dans la ville basse et dans Limoilou, le gris et le rouge dans la ville haute. Dans la banlieue, il y a plus de contrastes, plus de jeux de couleurs. La couleur correspond au matériau extérieur, soit le gris pour une façade de pierre, le rouge pour la brique, le blanc et les couleurs pastel pour le stuc et le bois.

On a compilé dans le tableau qui suit des données statistiques du principal matériau extérieur dans les différentes municipalités de la région. On constate dans l'ensemble que la brique est le matériau le plus utilisé à l'extérieur des logements, soit dans 62 p. 100 des cas, suivi du bois utilisé à l'extérieur de 21 p. 100 des logements. A Lévis et à Lauzon, le bois est le principal revêtement extérieur.

Quant à la forme même de la maison, le style architectural s'y révèle de toutes les époques: on y remarque les façades bien françaises de la rue d'Auteuil, les maisons anglaises et écossaises situées derrière le Château Frontenac, les vieilles maisons normandes situées le long de l'avenue Royale, les quartiers de "*brick and mortar*" des maisons en série à deux étages des secteurs populeux, les maisons laurentiennes à pignon de la ville basse, enfin les banlieues à l'amèricaine, avec centres d'achats, plains-pieds, maisons à ressauts (*split-levels*) et les maisons à appartements de la ville haute (le quartier du parc Falaise par exemple) et de certains coins de la côte de Beaupré.

On retrouve sur la rive sud la maison laurentienne en bois le long de l'ancienne route principale en bordure du fleuve, et beaucoup de maisons en brique, mais peu de quartiers neufs.

Des relevés statistiques intéressants ont été compilés sur l'habitation domiciliaire lors du recensement de 1951. On présente dans le tableau qui suit quelques données statistiques sur le nombre de logements occupés, l'année de leur occupation et le matériau extérieur, pour chacune des dix-sept municipalités et pour l'ensemble de la région métropolitaine.

Quelques données statistiques sur le logement dans la région de Québec en 1951.[1]

	Nombre de logements occupés	Nombre de maisons seules	Nombre d'appartements et de plains-pieds	Nombre de pièces par logement	Principal matériau extérieur						Année d'occupation	
					Bois	Brique ou revêtement brique	Imitation similibrique	Stuc	Pierre	Autres	Nombre avant 1946	Nombre 1946 à 1951
Québec	34,970	2,620	30,900	5.2	2,630	29,050	1,165	240	1,525	360	16,970	18,000
Sillery	2,155	1,370	735	6.6	520	1,275	110	135			700	1,455
Ste-Foy	770	365	405	6.4	310	260					280	495
Petite-Rivière	157	100	—	6.							—	—
Québec-Ouest	1,302	205	1,065	4.4	625	175					370	930
Charlesbourg	1,084	485	610	5.9	360	440					395	600
St-Michel-Archange	10	—	—	—							—	—
Giffard	1,276	260	1,005	5.3	210	450					430	845
Beauport	960	410	550	6.3	255	380					490	475
Beauport-Est (Villeneuve)	219	—	130	5.6							—	—
Lauzon	1,890	790	1,050	6.	1,320	310					925	980
Lévis	2,437	865	1,540	6.5	1,475	630	275				1,175	1,260
St-David	233	170	—	7.1							140	—
St-Télesphore	48	—	—	—							—	—
St-Romuald	939	650	280	6.7							590	345
Courville	636	195	440	5.3							240	395
Montmorency	1,116	—	1,040	5.	360	575					630	495
Total (Dix-sept municipalités)	50,202	8,435	39,750	5.8	8,065	33,545	1,550	375			23,335	26,275
Région métropolitaine	54,928	11,345	41,800	5.4	11,825	34,365	5,270	545	2,105	820	25,810	29,120

[1] Tous les chiffres sont tirés de l'échantillon de 20 p. 100 des logements. En raison de l'erreur d'échantillonnage, les chiffres de moins de 100 sont indiqués par un trait (—).

SOURCE: Recensement du Canada, 1951, Vol. III, Tableau 18, 19. Québec—Caractéristiques de la population et du logement par secteur de recensement, 1951, Bull. CT-4. Ottawa, 1953.

Tirons les conclusions suivantes:

a) il y a plus de maisons seules que de maisons à appartements dans deux municipalités: Sillery et Saint-Romuald,

b) le nombre de maisons seules représente 16 p. 100 du total des logements occupés dans la région métropolitaine,

c) on compte 1,745 maisons jumelées dans la région métropolitaine,

d) la moyenne du nombre de pièces par logement est de 5.8 pour l'ensemble des 17 municipalités,

e) plus de 50 p. 100 des logements ont été construits après 1946.

Comparons la région de Québec à celles de Hamilton et d'Ottawa, régions métropolitaines ayant une population et un nombre de logements comparables:

a) la proportion de maisons seules est plus grande à Ottawa (42 p. 100) et à Hamilton (68 p. 100) qu'à Québec (16 p. 100 seulement),

Figure 9. Utilisation du sol ou plan fonctionnel de la région de Québec en 1955.

b) le nombre de maisons jumelées est sept fois plus considérable à Ottawa, et cinq fois plus à Hamilton,

c) le nombre moyen de pièces par logement dans les trois régions est le même, soit 5.4 pièces,

d) on note moins de maisons en brique à Ottawa (53 p. 100) qu'à Québec (62 p. 100), mais le même pourcentage à Hamilton (61 p. 100); le nombre de maisons en bois est à peu près le même. La grande différence réside dans le nombre de maisons en stuc qui est douze fois plus élevé à Ottawa et huit fois à Hamilton.

L'UTILISATION DU SOL

La carte d'utilisation du sol (Figure 9) s'appelle aussi "plan fonctionnel" car elle montre l'usage que l'on fait de chaque "bloc" construit et non construit. Le plan fonctionnel complète l'étude de la physionomie d'une ville: il permet de voir le tracé des grandes artères et des rues, l'emplacement des parcs, des gares de triage et des voies ferrées, des installations portuaires, des zones non utilisées et des zones encore boisées ou en culture. Quant aux blocs construits, la lecture de la carte nous renseigne sur leurs fonctions.

Québec compte plusieurs zones industrielles; les principales sont:

1) le centre industriel de Saint-Malo,
2) le district situé des deux côtés de la voie ferrée du Pacifique-Canadien, du centre industriel de Saint-Malo à la gare,
3) le long de la rue Saint-Vallier dans le quartier Saint-Roch,
4) l'axe de la rue Dorchester,
5) le long de la rivière Saint-Charles dans Limoilou,
6) la gare de triage des chemins de fer Nationaux et l'usine de l'*Anglo Pulp*,
7) le long de la voie ferrée, sur la côte de Beaupré, à Giffard et à Villeneuve,
8) les chantiers maritimes de Lauzon,
9) à l'embouchure de la rivière Etchemin,
10) enfin le port, en particulier les installations du Bassin Louise et de l'Anse-au-Foulon.

Notons l'absence d'industries dans la ville haute. Le grand complexe industriel de Québec est concentré à l'intérieur d'un rectangle dont les extrémités sont Saint-Malo et l'usine de l'*Anglo Pulp*. On comptait, en 1955, plus de 250 bâtiments industriels où l'on manufacturait un produit quelconque.

Les zones commerciales sont plus étendues. La première en importance est la zone de commerce de gros située dans la Basse-Ville. Elle se prolonge d'ailleurs vers le nord-ouest pour rejoindre la grande zone de commerce de détail de la rue Saint-Joseph et du boulevard Charest. Les autres centres de commerce de détail sont la rue Saint-Jean, la Canardière, la Première et la Troisième Avenues à Limoilou et la zone en forme de S, à Lévis, le long des rues Wolfe, Saint-Georges et Desjardins. Voilà les principales zones commerciales; ajoutons les nouveaux centres d'achats et les grands motels qui se localisent à la périphérie, aux portes de la ville, et les zones de distribution du pétrole le long du fleuve, à Sillery surtout.

Les immeubles publics, semi-publics et privés, à cause de leur nombre et de leur situation, donnent au paysage urbain de Québec un aspect particulier. Ils sont concentrés dans la ville haute, près des édifices du parlement provincial, et tout autour de la colline de Québec, le long des chemins Sainte-Foy et Saint-Louis. Comme ils sont pour la plupart entourés de jardins, de parcs ou de fermes, ils donnent à Québec une ceinture verte que bien des villes désirent, mais une ceinture verte en grande partie inaccessible parce que privée.

La plupart des blocs construits servent cependant au logement; ils sont classés comme blocs résidentiels et remplissent le damier urbain.

A Québec, il faut signaler aussi quelques constructions à fonctions spéciales, entre autres fonctions militaire et touristique: la Citadelle, les remparts et les tours Martello.

Enfin, tous les blocs sont reliés indirectement par un réseau complexe de rues (375 milles), de routes (20 milles) et de fils électriques, et, dans le sous-sol, par des tuyaux d'aqueducs et d'égouts (315 milles).

CONCLUSION

Cette esquisse des principaux traits physionomiques de Québec et de sa banlieue immédiate donne une description de l'étendue, de la densité, de la hauteur des bâtiments et de la fonction de la zone construite. Les quelques notes sur l'âge et le matériau extérieur des maisons et des édifices complètent la description. Ce sont là des traits qui nous permettent de reconnaître une agglomération urbaine dans son aspect extérieur, car "c'est par leur aspect extérieur que se reconnaissent et se classent les paysages"[1].

[1] G. Chabot: Les Villes, p. 12.

RÉSUMÉ

The field of urban geography suggests many types of surveys, this one is devoted to the study of some of the urban physical characteristics of the Quebec area.

The Quebec urban and suburban areas comprise the whole contiguous and continuous built up area. Seventeen municipalities are included, covering 25 square miles with a population of 275,000 inhabitants (1951). The area is divided by the St. Lawrence River into two regions: the left shore region including Quebec City and 11 more municipalities, the right shore region including Lévis and 4 other municipalities.

The first urban characteristic described in this article is the territorial expansion of Quebec from 1690 until 1955 (Figure 1) by which time the built-up area had reached 25 square miles in extent. Figure 5 shows the building density per block, i.e., the percentage of roof coverage per block as determined from aerial photographs. The third map (Figure 6) illustrates the height of buildings, thus giving the third major characteristic of an urban area, its third dimension. In addition to the roof coverage and height of buildings, several minor characteristics are also described such as the age, the colour and the exterior construction materials.

The last map (Figure 9) is a land use or a functional plan indicating the use of each block (industrial, commercial, residential, or institutional) and the use of the various open spaces that are an integral part of the Quebec area.

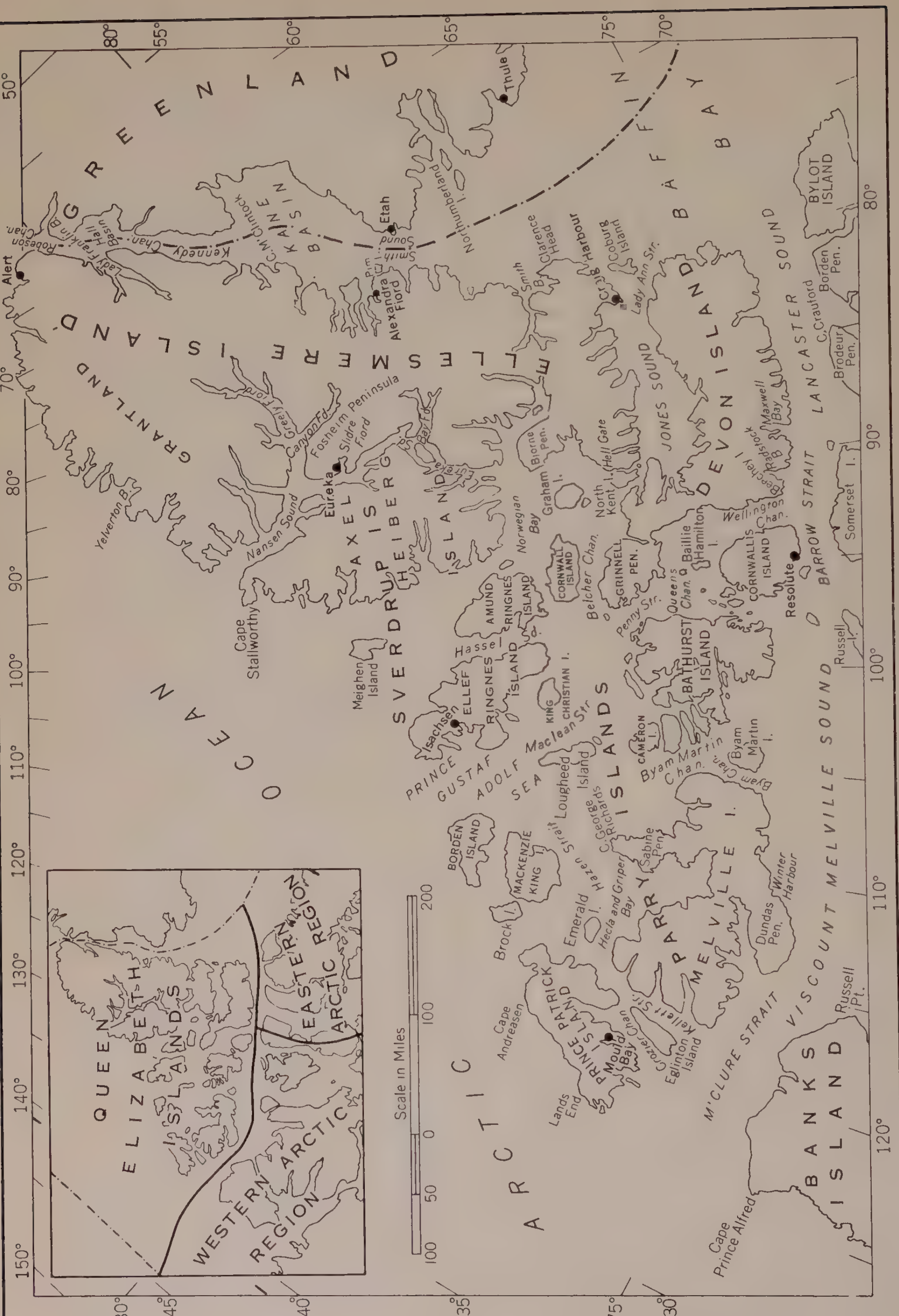

Figure 1. General map of the area.

GEOGRAPHICAL ASPECTS OF WEATHER AND CLIMATE AT EUREKA, NORTHWEST TERRITORIES

Victor W. Sim

This paper is a study of weather and climate and their influence upon human activity in the vicinity of Eureka, the joint Canadian-United States weather station on the west coast of Ellesmere Island. Temperature, precipitation, wind direction and velocity, and visibility are dealt with both as interesting phenomena in themselves and as they relate to accessibility and movement within the area.

The study is based upon published meteorological data[1] and upon observations made in the field by the writer during the period from May to September, 1955 while carrying out a study of the physical geography of Fosheim peninsula. Considerable use has also been made of the work of R. W. Rae.[2]

Eureka (80° 01' N., 85° 39' W.) is on the north shore of Slidre Fiord, a 16-mile long indentation opening southeastward from Eureka Sound into the heart of Fosheim peninsula. It is one of five weather stations in the Queen Elizabeth Islands. Since 1947, when the station was established, regular three-hourly surface weather observations, and twice-daily rawinsonde "runs" together with pilot balloon ascents have been made.

The surface of Fosheim peninsula surrounding Slidre Fiord is a low, rolling sedimentary plain rising gently to heights of 350 or 400 feet above the shores of the fiord. A thin surface cover of residual rock material overlies gently folded incompetent sandstones and shales. The highland areas, Northwest Ridge, Hare Cape Ridge, and Black Top Ridge, rise to elevations of 2,000 to 2,500 feet and are structurally controlled by cores of basalt and gabbro (Figure 2). The flanks of these massif areas are formed of the steeply dipping sandstones and shales previously mentioned. Frequent dykes and sills appear at the surface and extend for considerable distances.

Lowland areas are generally well vegetated. Arctic willow (*Salix Arctica*), mountain avens (*Dryas integrifolia*), and a wide variety of other flowering plants grow on the sheltered valley sides and in the headwater

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[1] Canada, Dept. of Transport, Met. Divn. Climatic Summaries for Selected Meteorological Stations in Canada. Vol. I (c. 1948), II (1948), III (1956), and addendum to Vol. I (1954), and Canada, Dept. of Transport, Met. Divn. Monthly Record, Meteorological Observations in Canada. January, 1948 to December, 1952.

[2] Rae, R. W.: Climate of the Canadian Arctic Archipelago. Canada, Dept. of Transport, Met. Divn., Toronto, 1951.

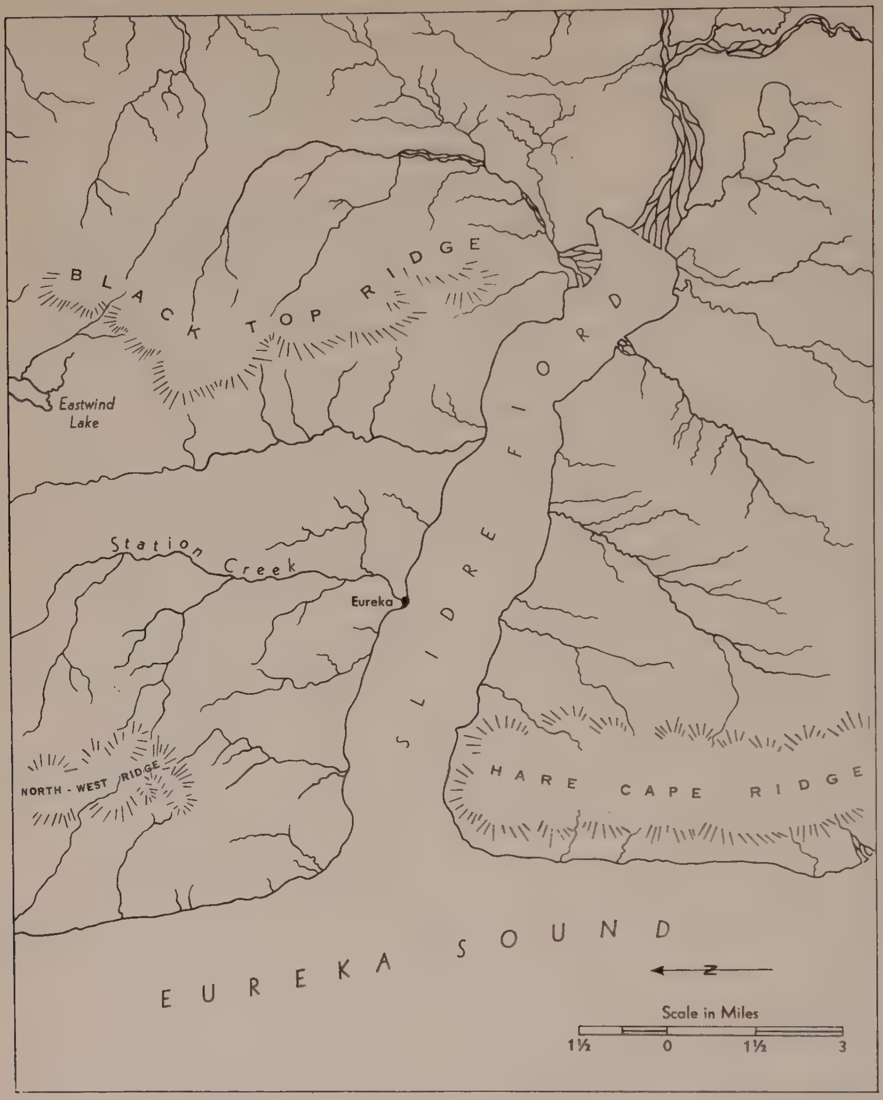

Figure 2. The site of Eureka.

basins of the small streams that flow across the region. The inter-fluvial ridges and sandy plains are more barren but even here mosses, lichens, purple saxifrage (*Saxifraga oppositifolia*) and arctic willow have a wide distribution. The upland areas are virtually barren. Steep slopes and frost shattered rock debris prevent the growth of most plant species, although there are scattered patches of purple saxifrage, moss, and lichen. Wolves, foxes, arctic hares, and musk-oxen are numerous and over 20 species of birds have been identified in the Fosheim peninsula.

GENERAL CLIMATIC CONTROLS

Although most of the Queen Elizabeth Islands are subject to ameliorating maritime climatic conditions as a result of the extensive areas of water that are ice-free for at least part of the year, the climate of Eureka is distinctly continental.

The mean minimum February temperature is −45 deg. F. at Eureka, 4 deg. F. colder than that of Isachsen on nearby Ellef Ringness Island, whereas the July mean maximum is 6 deg. F. warmer than that of Isachsen, and 3 deg. F. warmer than that at Resolute, 400 miles to the south.

The climate of the Fosheim peninsula, on which Eureka is situated, is more directly influenced by the adjacent land masses of Axel Heiberg and Ellesmere Islands than by the surrounding waters.

Differences in extreme temperatures of the three stations are due to the relative capacities of land and water areas to absorb heat.

Eureka is considerably north of the main easterly drift of cyclonic storms which originate, in winter, along the polar front at or near the northern mainland coast and move northeastward across Baffin Island toward the low pressure trough over Baffin Bay and Davis Strait. Day-to-day precipitation and changes in temperature are caused by changes in dominant air masses, shifts in wind direction, and by other local factors.

The pressure system in the Queen Elizabeth Islands during the winter is dominated by a prominent ridge of high pressure extending in a north-south direction from Prince Patrick Island along the Mackenzie River valley to Great Bear Lake[2]. A complementary low pressure trough is centered over the Baffin Bay-Davis Strait area. In general, the main flow of air within this system in the vicinity of Eureka is from the east and northeast.

During late winter and early spring a broad high pressure area gradually extends over the entire arctic archipelago. Mean monthly pressures increase from a mean midwinter low of 1014.3 mb. in January to a mean monthly maximum of 1021.5 mb. in March, and generally prevail into April. With rising temperatures in May and June, pressure begins to fall and reaches a mean mid-summer low of 1009.7 mb. in July. Widespread low pressure conditions continue until October when increasing pressure over the archipelago re-establishes the winter regime. A mean winter maximum of 1012.5 mb. is reached at Eureka in December.

The extreme meteorological conditions at Eureka are graphically illustrated in Figure 3, by comparing this northern station with the sub-arctic town of Churchill and the city of Toronto in southern Canada. The

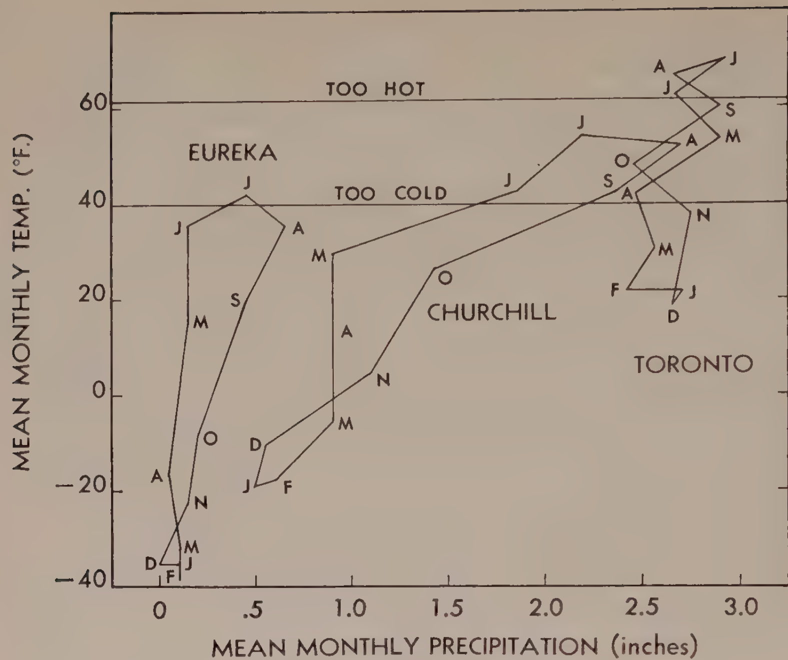

Figure 3. Climographs of Eureka, Toronto and Churchill.

climographs of these three centres reveal that whereas four months at Churchill and Toronto fall within the comfort frame of optimum human activity only one month falls within that frame at Eureka.

TEMPERATURE

From the point of view of human occupation in the Eureka area the most outstanding climatic factor is the low temperature which prevails throughout the year. Temperature exerts a direct and vital influence upon the extent of outdoor activity at the weather station, upon the usability of the airstrip, and upon the ice conditions and length of the navigation period on the sea route to Eureka.

The mean annual temperature is −3°F. at Eureka, 3 degrees cooler than the mean annual temperature at Alert on the northern coast of Ellesmere Island, 1 degree warmer than the annual mean at Isachsen, and 6 degrees cooler than Resolute.* Sub-zero mean monthly temperatures occur from October to April inclusive. The lowest mean monthly temperature for the year is recorded in February (−38°F.) coinciding with the mid-winter period of high pressure. Maximum mean monthly temperature for the year (42°F.) occurs in July. Figure 4 shows graphically the marked

* Meteorological statistics are for a 3-year period.

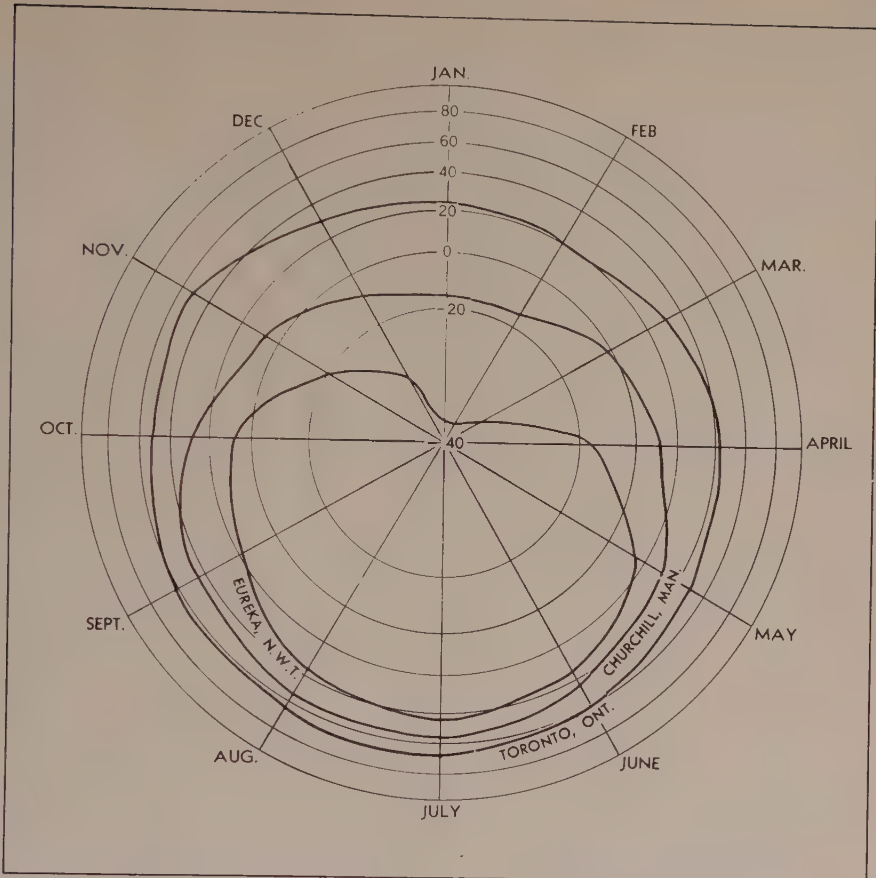

Figure 4. Mean monthly temperatures at Eureka, Toronto and Churchill.

relative coolness in each month at Eureka in comparison with Churchill and Toronto.

The five months from May to September have mean temperatures above 0°F., but only June, July and August have mean temperatures above freezing (32°F.). Even during these three months temperatures may drop below freezing at any time. The average date of the last frost in spring* (that is, the last date on which a temperature of 32.5°F. or lower is recorded) at Eureka is June 25. The average date of the first frost in autumn is August 10. The average duration of the frost-free period for the three years for which information was available was 46 days. By comparison, Isachsen has an average frost-free period of only 6 days extending from July 14 to July 20, and Resolute has a frost-free period of 16 days, extending from July 9 to July 25.

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* According to Department of Transport usage spring frost is one that occurs on or before July 15, and a fall frost is one that occurs on or after July 16. (Climatic Summaries, Vol. III, Frost Data, p. 1).

The addition of new information could result in changes in these figures. For example, during the summer of 1955 at Eureka, the last spring frost occurred on June 25 (31.9°F.) and the first autumn frost occurred on July 30 (31.1°F.) giving a frost-free period of only 30 days (Figure 5). As temperature records at arctic stations at the present time are short term, the indicated length of the frost-free period is only approximate.

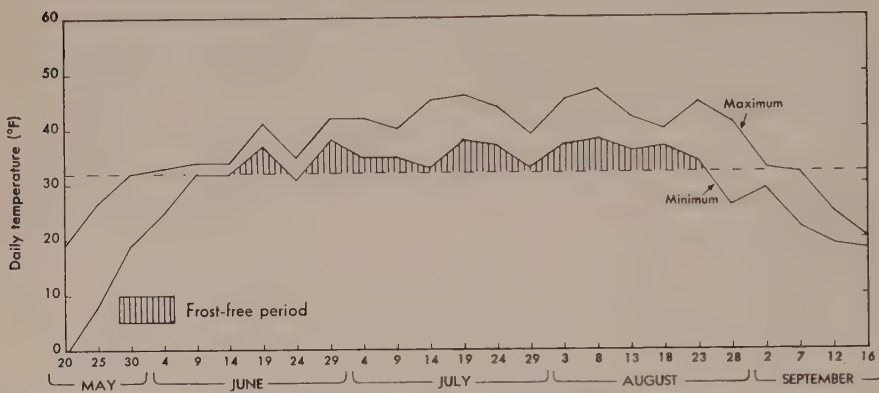

Figure 5. Frost-free period at Eureka, summer 1955.

The dates of the ending of persistent frost in the spring and the beginning of persistent frost in the autumn are of greater importance in the operation of the Eureka weather station than are the dates of the occurrence of the last spring and first autumn frosts. Soon after the beginning of the period of persistent thaw in early June, the airstrip becomes a muddy quagmire and is unusable. In 1955, the mean daily temperature first rose above freezing on June 5. Thereafter it fell below freezing only once, on June 12, when it was 31.5°F. By June 9 the thaw had progressed to the point where flat and depressed areas of unconsolidated surface materials, such as the airstrip, were saturated, but by mid-July natural drainage and maintenance made it possible for aircraft to land.

Heavy aircraft used to resupply the arctic weather stations are unable to land in the autumn until the ground is frozen to a depth of at least 2 feet. During the summer, melting in subsurface ice lenses causes local subsidence of the airstrip surface or the outwelling at the surface of quantities of melt water, making the airstrip hazardous for landing aircraft.

Although the first autumn frost in 1955 was recorded on July 30 (31.1°F.) and the second on August 16 (31.8°F.) the mean daily temperature did not fall below freezing until September 1 when it was 31.8°F. Thereafter, the mean daily temperature failed to rise above freezing and the

airstrip had frozen solidly enough by September 21 to receive the first heavy aircraft (a C-119) of the autumn airlift. The airstrip at Eureka becomes unsafe for use approximately one week after the mean daily temperature first rises above 32°F. It is not considered fully operational in the autumn until approximately three weeks after the mean daily temperature first falls below 32°F. The airstrip is judged to be operational in the autumn when an iron rod can be driven into the ground and is dry on removal.

The dates when navigation is possible in the Eureka area are of considerable importance as it is more efficient to resupply arctic stations by sea rather than by air.

The route followed by the icebreaker which carries out the resupply voyage to Eureka in late summer extends from Baffin Bay, through Jones Sound, to Hell Gate channel, Norwegian Bay, and Eureka Sound to Slidre Fiord. Ice in Jones Sound offers little difficulty to navigation. The greatest difficulties are usually encountered in Hell Gate and Norwegian Bay. In the latter sea arctic ice chokes the bay with rotten ice subject to intense pressure disturbances. These conditions extend a short distance northward along the southern part of Eureka Sound. The northern part of the sound leading to Slidre Fiord is relatively clear of ice by early August.

Ice conditions are usually best for navigation between August 20 and September 15. Before August 20 the winter ice in the more constricted parts of the route has not broken up sufficiently to permit navigation. After August 25 the steady decline in mean daily temperatures results in the rapid formation of young ice and the consolidation of floe ice.

In most years ice in Slidre Fiord begins to break up by mid-July. However, the presence of loose floe ice or large bergs in the fiord in late August when the icebreaker reaches Eureka, hinders the transfer of supplies to shore. Slidre Fiord usually begins to freeze over shortly after September 1.

Since the station at Eureka was established in 1947 icebreakers have successfully reached Slidre Fiord 8 times. Prior to 1955, the resupply mission was carried out by the United States government using coastguard or navy icebreakers. In that year the Canadian government assumed responsibility for the operation. During the 1956 voyage ice conditions were good in Lancaster and Jones sounds. Only in Norwegian Bay was any difficulty encountered. Even here, however, although the water was ten-tenths covered by ice it was possible to cross the bay by using open leads.[3]

[3] Black, W. A. A Report on Sea Ice Conditions in the Eastern Arctic, Summer, 1956. Canada, Dept. of Mines & Tech. Surv., Geog. Br., Geog. Paper No. 9, Ottawa, 1956. Maps, illus. 32 pp.

PRECIPITATION

Precipitation totals are extremely low over the entire area of the Queen Elizabeth Islands. No station reports a mean annual precipitation of more than 7 inches. Eureka with a mean annual total precipitation of 2.59 inches has the lowest precipitation of the five stations in the islands and the lowest total of any regularly reporting meteorological station in Canada. The extreme dryness at Eureka compared with Churchill and Toronto is shown in Figures 3 and 6. Though the mean figures in the following discussion have been established on the basis of short-term records and are therefore subject to large annual variations they do indicate the prevailing trend.

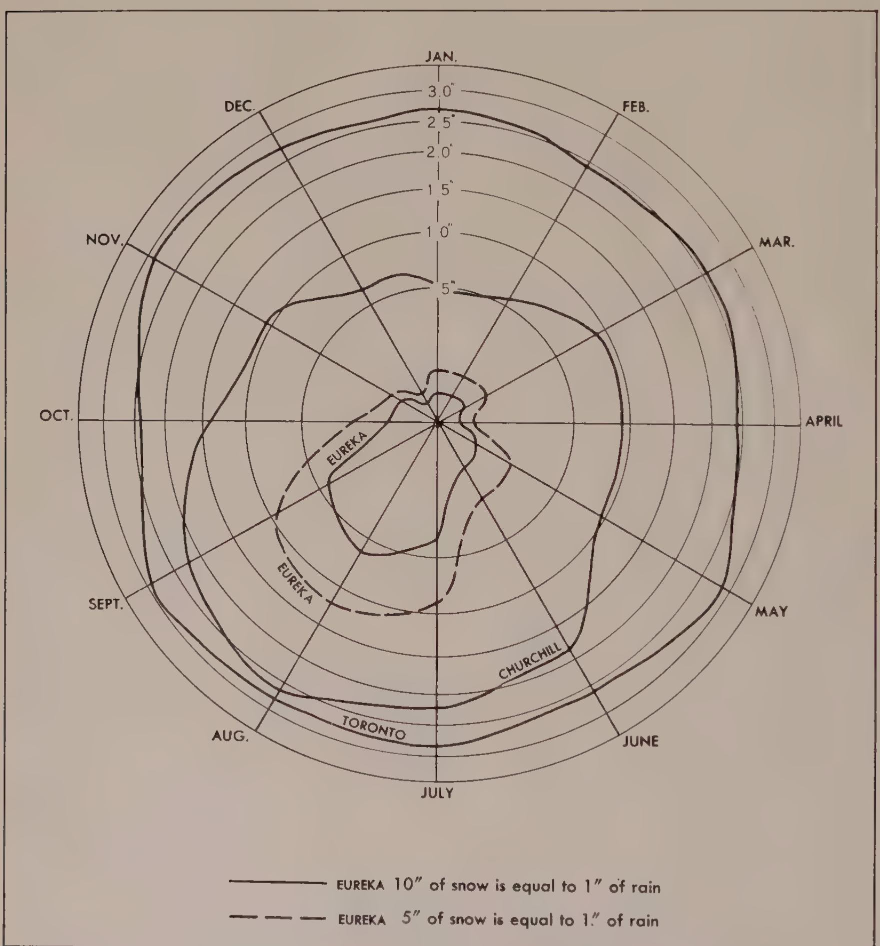

Figure 6. Mean monthly precipitation in inches at Eureka, Toronto and Churchill.

It has been suggested that the position of Fosheim peninsula within the precipitation shadow of Greenland and central Ellesmere Island has resulted in low precipitation amounts during the period from October to April when winds blow from the east.[4] From May to August prevailing winds are from the west and northwest. During this season widespread low pressure conditions over the land areas cause winds to blow from the permanent high pressure area centred over the pack ice in the arctic basin. This air is relatively cool upon arriving over Axel Heiberg and Ellesmere Islands. It is slightly warmed as it passes over the land and the little precipitation that occurs is probably the result of local convectional instability.

Eureka is north of the area that is under the direct influence of cyclonic storms. Intensification of storm activity in the vicinity of the "Thule low" (the winter low pressure system centred over Baffin Bay) probably contributes at least part of the precipitation at Eureka at this season. It seems likely, however, that much of the total annual precipitation at Eureka falls as a result of changes in local air mass domination, or as a result of changes in temperature.

Of the total annual precipitation 59 per cent falls as snow and 41 per cent as rain. Snow may fall in any month and a sufficient quantity has been recorded in each month to establish mean monthly snowfall values. Virtually all rain falls in June, July, and August. Only a trace of rain has been recorded in September. The mean annual snowfall is 15.4 inches.* The mean annual rainfall is 1.05 inches.

The minimum mean monthly snowfall is recorded in June and July, when approximately half an inch of snow falls. Rising temperatures generally ensure that lowland surfaces are clear of snow by July, but snowbanks may remain in sheltered gullies and depressions in highland areas throughout the summer. Occasional summer squalls may cover the uplands with a thin mantle of snow. On June 20, 1955, 0.12 inches of snow fell in a short period and remained for several hours before melting.

Maximum mean monthly snowfall occurs in September when, coinciding with an increase in stormy conditions, an average of 4.6 inches of snow falls. Snowstorms are frequent and much of this snow persists through the winter. Following a drop in mean monthly totals during the

[4] Wilson, H. P., and Markham, W. E. Terminal Weather Conditions at Eureka, Isachsen, Mould Bay and Resolute. Canada, Dept. of Transport, Met. Divn., Technical Circular No. 90, Edmonton, 1951, p. 9.

* By Department of Transport convention total precipitation is established by converting amount of snowfall to amount of rainfall in the ratio of 10 inches of snow to one inch of rain. Actually, according to Rae, this relationship is only true in temperate latitudes where the snow is soft and fluffy. In the arctic, snow is usually crystalline or granular in texture. Rae suggests that a conversion ratio of 4 or 5 to 1 would be more valid (Rae: op. cit., p. 16).

more stable winter months there occurs a secondary maximum in May when an average of one inch of snow falls.

Rainfall at Eureka is restricted almost entirely to the months of July and August and falls in the form of light showers of short duration. Traces of rain fall in June and September. Heavy showers or showers of long duration are rare. Few thunderstorms occur in the Queen Elizabeth Islands.

Rain is seldom an impediment to travel in Fosheim peninsula. Snow, however, may fall so thickly and be blown along by the wind to such an extent that visibility decreases almost to zero. Field studies involving close observation of ground conditions are interrupted on these occasions and after the beginning of September frequent snow squalls prevent field work completely.

Using a conversion ratio of 10 to 1 the maximum mean monthly precipitation at most weather stations in the Queen Elizabeth Islands is found to occur in August and is composed almost entirely of rain. If the 5 to 1 conversion ratio were used, however, the maximum mean monthly precipitation would occur in September and would be composed almost entirely of snow.

CLOUD AND VISIBILITY

Seasonal cloudiness and variations in visibility must be considered in planning the aerial resupply flights to the satellite weather stations as aircraft operation is directly affected by the amount of cloud cover.

Cloud Cover: There is pronounced seasonal variation in the amount of cloud cover at Eureka, and the available statistics reveal that mean cloudiness, expressed as a percentage of total sky covered, is least during the late autumn and winter months and greatest during the summer and early autumn. September is the cloudiest month of the year with mean cloud cover of 78.3 per cent which coincides with the maximum mean monthly snowfall. September is also the period of lowest visibility.

After the September maximum mean, cloudiness decreases to a winter average of 35 or 40 per cent. Rae suggests that the poorly defined maximum in February and March may result from weather observers reporting a greater amount of cloud cover as returning daylight in the spring makes it possible to see the cloud cover more clearly.[2]

The mean cloud amount at arctic stations is at a minimum during late autumn and winter when low temperatures and high pressure masses extend over most of the arctic areas. However, local variations in cloudiness

even at this season are apparent. Rae points out that "the amount of winter cloud depends largely upon the amount of open water near the station"[2]. At Resolute, for example, open water in Lancaster Sound and Barrow Strait may be present throughout most of the winter and mean cloudiness approaches 50 per cent. At Eureka, by contrast, extensive areas of land and water surface are frozen throughout this period and temperatures are so low that no moisture is available in a form suitable for conversion to cloud. Moreover, rapid cooling of the land surface during the winter leads to cooling of the air at ground level. An inversion thus exists that prevents the formation of an extensive cloud cover.[2] The mean cloudiness for the period from October to May is only 38.5 per cent when small amounts of cirrostratus cloud develop.

During the late spring of 1955 an almost uninterrupted period of fine weather continued, with only brief periods of overcast weather, from early April until late May. Mean cloudiness at Eureka during April has been calculated to be 33.2 per cent, increasing to 41.4 per cent in May.

During late May and June the temperature of the air over the ice-covered water channels surrounding Fosheim peninsula rises very little above freezing point and the winter inversion persists.[2] These comparatively stable conditions in the early part of the arctic summer are unfavourable to the formation of cloud. Frequently during the summer of 1955 thick banks of low stratus cloud were observed over Fosheim peninsula whereas the skies over the ice-covered area of Eureka Sound, Greely Fiord, and Canyon Fiord were clear. Later, when pools of melt water and open leads appeared, clouds began to form over the channels.

In the June thaw, melt water flowing or standing combines with above-freezing temperatures and local turbulence to produce stratus cloud that may persist for several days in the Eureka area.[2] This low cloud appears at an elevation of approximately 1,000 feet above sea level. Mean cloudiness at Eureka increases to 65.1 per cent in June and to 74 per cent in July. As the land warms up, the winter temperature inversion disappears and cumulus clouds occur more frequently and at greater elevations than the stratus clouds. Mean cloudiness at this time is only 5 or 10 per cent lower than the late spring maximum.[2]

Following the period of maximum cloudiness in September falling temperatures in October re-establish the winter inversion. Clouds now formed are of the stratocumulus type. At Eureka, as temperatures continue to drop, the available supply of moisture declines and results in a steady drop in mean monthly cloudiness which continues until January.

Part of the supplies needed each year to maintain the weather station at Eureka are transported by aircraft during the spring. This operation is generally scheduled to take place during the period of cloudless weather in April and May. The main airlift is flown, in most years, during the first 10 days in April. A final "clean-up" flight is flown in mid-May before the onset of cloudy weather.

Visibility. Fog and poor visibility exert one of the most direct influences upon air and sea transportation within the area of the weather station. Greenaway[5] states that fogs are most common during the summer and early fall but may occur at any time during the year. Coastal advection fogs are particularly noticeable in spring and summer when air warmed over the land moves over cool water or ice. In autumn, air warmed over the ice-free surfaces is cooled as it passes over the snow-covered land. At Eureka fogs of this type are seldom extensive nor do they persist for more than a few hours.

During the winter, ice crystal haze in the vicinity of Eureka seldom reduces visibility at the surface to less than 1,000 yards. It may, however, be a hazard to air navigation at elevations up to 20,000 feet. "Sea smoke" which forms at this season over ice leads is relatively unknown in Slidre Fiord where neither the small tidal movement nor the limited area of the fiord are sufficient to cause the formation of leads.

For statistical purposes poor visibility is considered by the Department of Transport to occur when the ceiling is below 1,000 feet or the visibility is less than 1½ miles. Good visibility conditions occur when the ceiling is above 2,000 feet and the visibility is more than 5 miles.

The accompanying graph (Figure 7) indicates the mean percentage when poor visibility conditions prevail at Eureka, Isachsen, and Resolute. In each month the latter stations exceed Eureka in percentage of time when poor visibility conditions are observed. At all three stations observations of poor visibility are at a minimum during the winter and early spring months, amounting to 5 per cent at Eureka for December, January and April. At Isachsen the minimum frequency is in April (15 per cent) and November (17 per cent). At Resolute the minimum frequency occurs in December (8 per cent) and in April (9 per cent). Between the midwinter low in poor visibility conditions and the secondary low in April there occurs a slight increase in poor visibility. This period appears on each of the graphs as a slight peak during February and March (Figure 7), and represents an increase of approximately 6 to 12 per cent.

[5] Greenaway, K. R.: My Experiences with Arctic Flying Weather. Royal Meteorological Society, Canadian Branch. Vol. 1, No. 9, Dec. 1950, p. 4.

At each of the three stations discussed the spring minimum in poor visibility coincides with high pressure conditions in April when good weather is experienced over most of the Queen Elizabeth Islands. Rae[2] suggests that in this month temperatures are sufficiently high to prevent the development of ice crystal haze. At the same time areas of open water are still so limited that extensive fog banks do not occur.

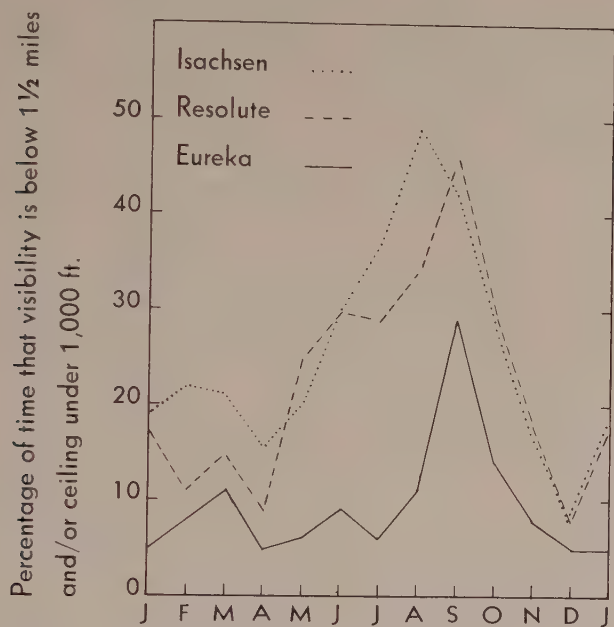

Figure 7. Graph of poor visibility conditions at three northern stations.

With rising spring temperatures and the resulting formation of a persistent stratus cloud deck, visibility conditions at Isachsen and Resolute steadily deteriorate after April. The general increase in poor visibility continues until a maximum is reached in August at Isachsen (49 per cent) and in September at Resolute (46 per cent). Thereafter it improves quickly until the minimum is established in December. At Eureka spring conditions persist with little change until July when an abrupt increase in poor visibility is experienced that reaches a maximum in September (29 per cent). At Eureka the percentage of time in any month when conditions of poor visibility exist does not exceed 29 per cent. In each month of the year flying conditions are better at Eureka than at the other stations.

The graph of good visibility (Figure 8) clearly indicates those periods when good atmospheric conditions prevail at the three stations. It should

be noted that statistics used in the preparation of this graph are for one year only (1952).

Wilson and Markham [4,6] point out that Eureka is protected by adjacent highland areas from the full effect of blowing snow. They conclude that flying weather at the arctic stations, including Eureka, is best in April and December. If daylight is also considered as a factor then April is unquestionably the best month. The worst flying weather is encountered in September, which is the month for the autumn resupply flights. If the flights were delayed until October when visibility has improved they would have to be made during the dark period.

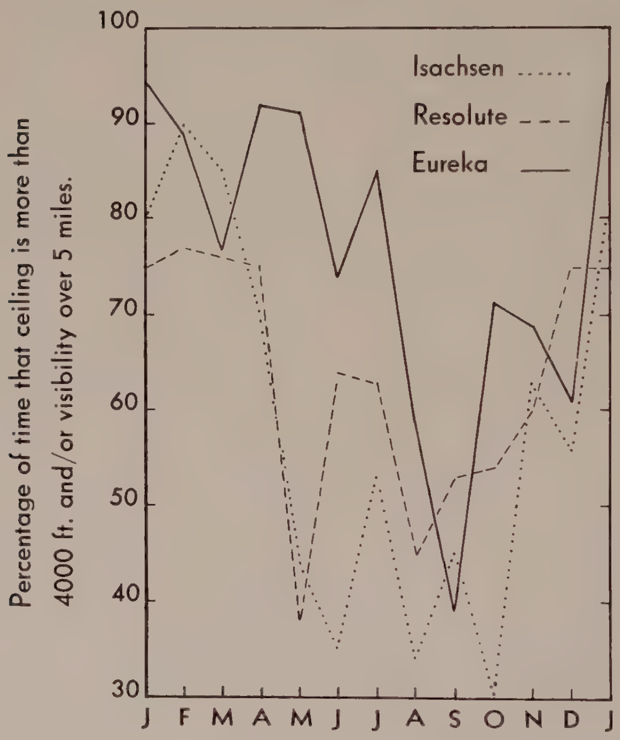

Figure 8. Graph of good visibility conditions at three northern stations.

Blowing snow may be an impediment to travel during the winter months. Even comparatively light winds pick up granular snow particles and blow them about. At wind speeds under 15 m.p.h. visibility is over 6 miles. The visibility, however, decreases abruptly with increasing wind speeds. At wind speeds of 25 to 30 m.p.h. visibility is less than 1 mile, and over 40 m.p.h. it is near zero.[2]

[6] Markham, W. G.: Aviation Weather Summaries for Selected Canadian Arctic Stations. Canada Department of Transport, Meteorological Division, Technical Circular No. 165, Edmonton, 1953.

WIND

Rae states that mean wind speeds in the arctic archipelago do not differ greatly from mean wind speeds at stations in southern Canada. Arctic winds seems to be more constant than winds in more southern latitudes. This impression, however, is not entirely valid. During the summer of 1955 it was frequently noted that the wind was fitful and variable. Periods of calm occurred with remarkable frequency. It is concluded that winds in the arctic seem stronger because the temperatures are low and the relative humidity is high. They appear to blow with greater constancy because they blow unimpeded over barren plains and because there are comparatively few sheltered locations for protection against them.

In general, the summer at Eureka, when the greatest amount of outdoor activity is possible, is a season of high winds, whereas the autumn and winter, when temperatures curtail such activity, are periods of relatively low winds. The number of observations of wind speeds between forces 1 and 3* for all months exceeds the mean number of observations of wind speeds between forces 4 and 7. During the summer months, winds of forces 1 to 3 blow more than twice as often as winds of forces 4 to 7; in the winter their frequency rises to more than 6 times the force 4 to 7 winds.

An insufficient number of observations of winds over force 7 have been recorded to establish a mean for any month. Winds stronger than fresh gale force were recorded only 14 times in the period from January, 1948 to December, 1952.

The greatest number of calms are recorded at Eureka in late winter, early spring and late autumn. In each of these periods an average of 27 observations of calm weather were made. The spring airlift to Eureka in April takes place during a period of maximum calm weather. From May to September the number of calms declines considerably reaching a low in June. The high frequency of calm weather at Eureka results from the location of the station at latitude 80° N. in a comparatively stable area beyond the direct influence of strong cyclonic disturbances.

WIND DIRECTION

Prevailing winds at Eureka blow either from the east or the west. The general wind system in the Baffin Bay-Davis Strait low pressure area causes the winds at Eureka to blow from the east from October to

* Values between forces 1 and 3 on the Beaufort wind scale indicate wind speeds between 1 and 12 m.p.h., that is, from light air to gentle breeze.

Values between forces 4 and 7 indicate wind speeds between 13 and 38 m.p.h., that is, from moderate breeze to moderate gale.

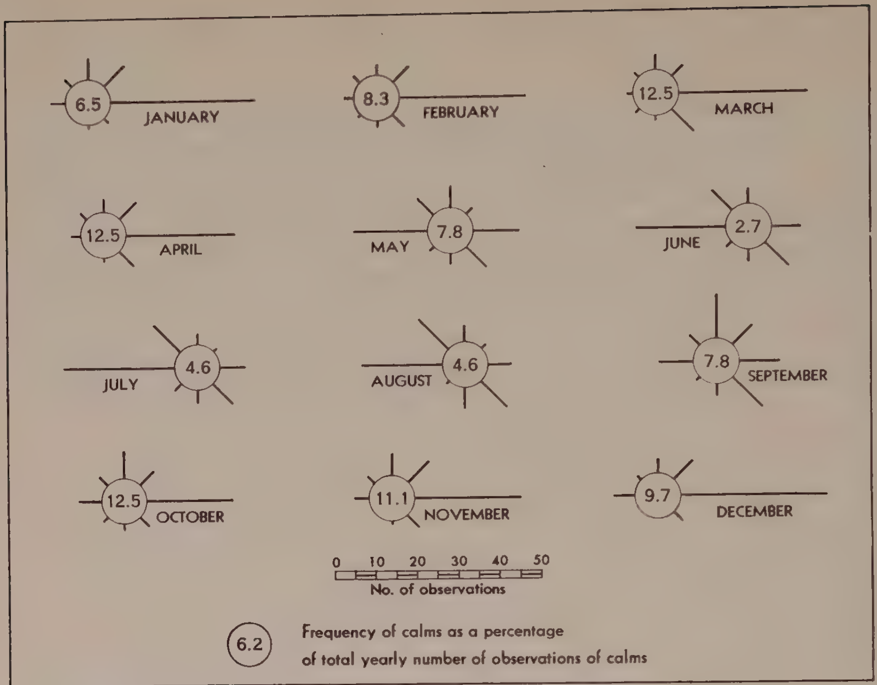

Figure 9. Prevailing winds at Eureka and frequency of calms.

April (Figure 9), a period coinciding with the period of greatest frequency of winds of forces 1 to 3. East winds are, in general, comparatively gentle and blow with the greatest frequency during January, February, and March.

Winds of secondary importance blow during the winter from the north, northeast and southeast; there are occasional winds from other directions, and winds from the south and southwest are rare.

May is a transitional month. The most frequent winds are from the west, but winds from the east and southeast still comprise a considerable part of the total. From June until August west winds are dominant (Figure 9) although northwest and north winds blow with considerable frequency. This period coincides with the period when winds of forces 4 to 7 are at a maximum. West winds may be defined as strong summer winds.

South winds reach a maximum in August. September is also a transitional month. Winds blow with considerable frequency from all directions except south and southwest.

During August when winds are from the west they often push masses of loose floe ice into Slidre Fiord from Eureka Sound. However, counter

currents have been observed pushing ice floes in a westerly direction towards the sound against the considerable force of a west wind. In any year there is an even chance that Slidre Fiord will be clear of ice on the arrival of the icebreaker in August.

The airstrip at Eureka is constructed in an east-west direction parallel with the direction of the prevailing winds. An earlier airstrip north of the present one was constructed in a north-south direction with the result that cross winds made aircraft landings and take-offs difficult.

RÉSUMÉ

L'article traite du temps et du climat d'Eureka en rapport avec les occupations humaines à la station météorologique qui y est établie depuis 1947. L'auteur a basé son étude sur des renseignements qui ont été publiés ainsi que sur des observations faites sur le terrain de mai à septembre, 1955. Il discute de la température et des précipitations, indiquant les effets qu'elles ont sur l'activité en plein air, l'utilisation de la piste d'atterrissage et l'accessibilité des navires de ravitaillement s'y rendant chaque été. De même pour les vents, les nuages et la visibilité qui sont des facteurs importants en navigation aérienne. En général, Eureka jouit de conditions de visibilité meilleures que plusieurs autres stations des îles Reine-Elisabeth et les vents ne présentent ordinairement pas d'obstacles à la navigation aérienne. Les raffales de neige, toutefois, entravent souvent les arrivés et départs d'avions. Les vents dominants sont de l'est en hiver et de l'ouest en été; pour cette raison, il a fallu reconstruire la piste d'atterrissage dans une direction est-ouest, de nord-sud qu'elle était.

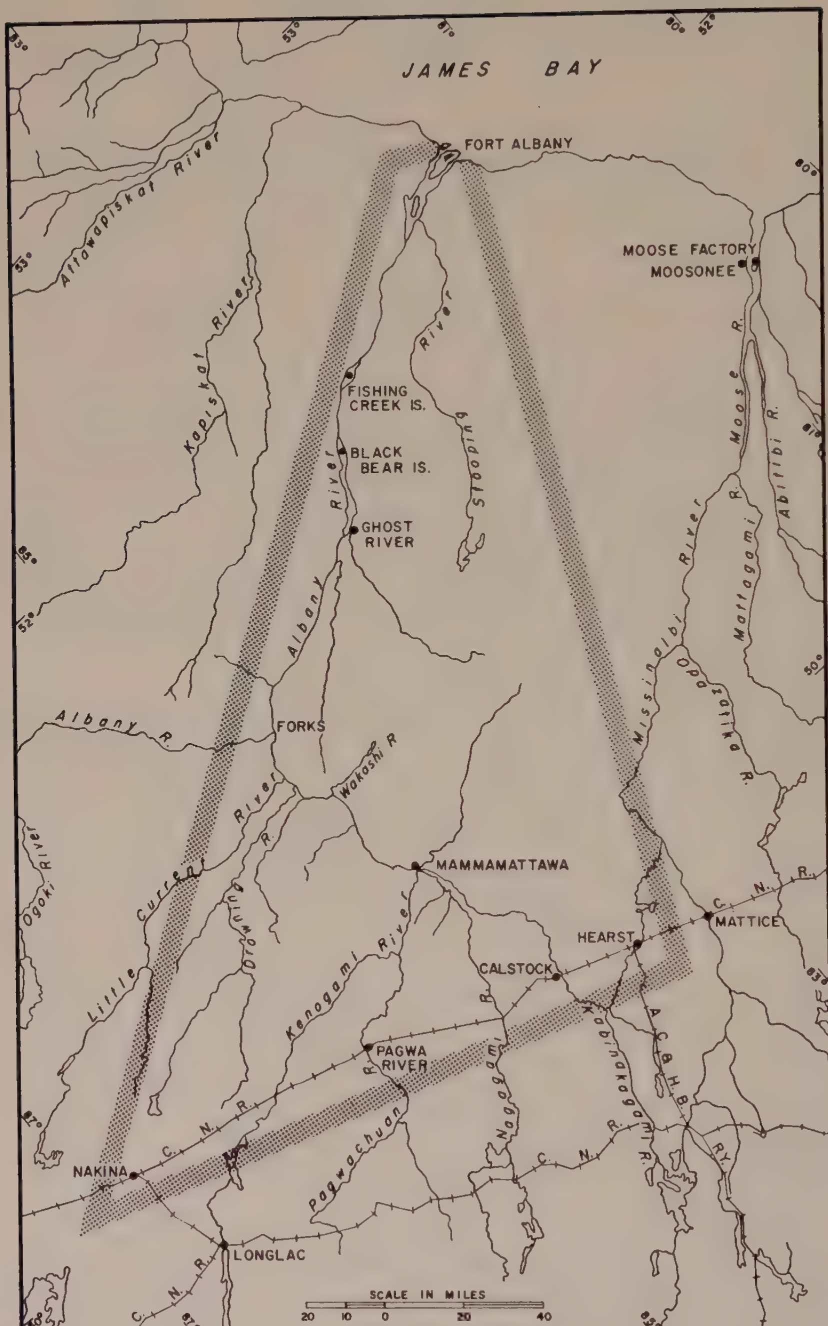

Figure 1. Location map.

HUMAN GEOGRAPHY OF THE LOWER ALBANY RIVER BASIN

*by W. G. Dean**

The area discussed in this study covers part of the basin of the lower Albany River in northern Ontario. It extends northeastwards from the Canadian National Railways line between Hearst and Nakina to Fort Albany on James Bay. This triangular-shaped area of about 22,000 square miles includes the lower Albany River, Kenogami River, and their tributary streams.

A geographical survey of this area was carried out in 1951 by canoe traverses down Pagwachuan, Kenogami, and Albany Rivers to James Bay, and along many of the tributary streams en route.

The influence of the physical environment is reflected not only in the culture of the indigenous inhabitants, but also in the economic potentialities of the area. This report outlines the physical background and attempts to relate some of these environmental influences on both the native and white cultures. In addition, the effects of the building of the railways during the early part of this century and the subsequent growth of white settlement in the area are discussed.

PHYSICAL ENVIRONMENT

Surface Features

The survey area lies in parts of three of the major landform regions of northern Ontario, the Long Lake upland, the Cochrane clay plain, and the Hudson Bay lowland.[1] In general, there is a monotonous similarity in the plain-like character of these three regions, but significant differences do occur.

The Long Lake upland is underlain by a knobby Precambrian surface largely covered with drift of considerable thickness. Much of this drift is till deposited originally as ground moraine and some is drumlinized. However, drumlinized till now appears only in a few localities, most of it having been modified by pro-glacial lake or glacio-fluvial action. In several

* W. G. Dean, B.A., M.A., Toronto, Assistant Professor of Geography, United College, Winnipeg. This paper is based on a larger field survey carried out by the writer as leader of a Geographical Branch party to the Albany River area in 1951. W. S. Brown assisted with the field work and contributed materially to the subject matter of this paper.

1 Putnam, D. F., et al. Canadian Regions. J. M. Dent & Sons, Toronto, 1952. p. 296.

places, such as on the western side of Kabinakagami River and to the southwest of Pagwa River, extensive sandy outwash deposits cover the surface. Here and there, occasional glacially-smoothed bosses of the underlying granitic and gneissic rocks outcrop through the drift cover. Drainage in this section is considerably better than in the adjoining sections to the north and east. This improved drainage is significant in its effects on the forest cover of white spruce, black spruce, and jack pine which is in general of superior quality.

One notable feature of the Long Lake upland is the broad depression through which Pagwachuan River flows in the northeastern part of the region. This 'valley' is 20 to 25 miles broad where the CNR line crosses it and, with elevations below 600 feet as compared with the general elevations of 700 to 800 feet to the east and west, it forms one of the lowest parts of the Canadian Shield in north-central Ontario.

The Cochrane clay plain constitutes the terrain east of Kabinakagami River. It is formed of a mosaic of clay, silt, sand, and gravel deposits, representing not only materials laid down in or reworked by ancient Lake Ojibway, but also materials associated with post-Lake Ojibway glaciation. The latter materials are apparent on air photographs of the drumlinized till area to the northwest of Hearst. Most of the Cochrane clay plain is very flat to gently undulating, with the result that drainage is generally poor. The larger rivers, lacking major tributaries, have cut canal-like channels into the plain, but undrained interfluves, usually covered with muskeg, abound.

The poor drainage combined with climatic and soil factors have produced a layer of peat ranging from a few inches to 6 feet or more over most of the clay plain. Relatively pure stands of black spruce and tamarack constitute the main forest except in the slightly elevated localities where mixed stands containing white spruce and various boreal deciduous trees are found.

The Hudson Bay lowland is entirely underlain by almost horizontally-bedded Palaeozoic limestones and shales covered by varying depths of drift. Below a general elevation of 450 feet the surface layers of this drift consist of silts, sands and clays of marine origin. The lowland as a whole forms a coastal plain of a uniformly flat slope gently inclining to James Bay. Along Albany River and its tributaries the slope averages 2 to 2.5 feet per mile. The rivers have cut narrow and in places deeply-entrenched valleys usually showing features associated with youthful stream development. Except along the banks of the main streams and on numerous and

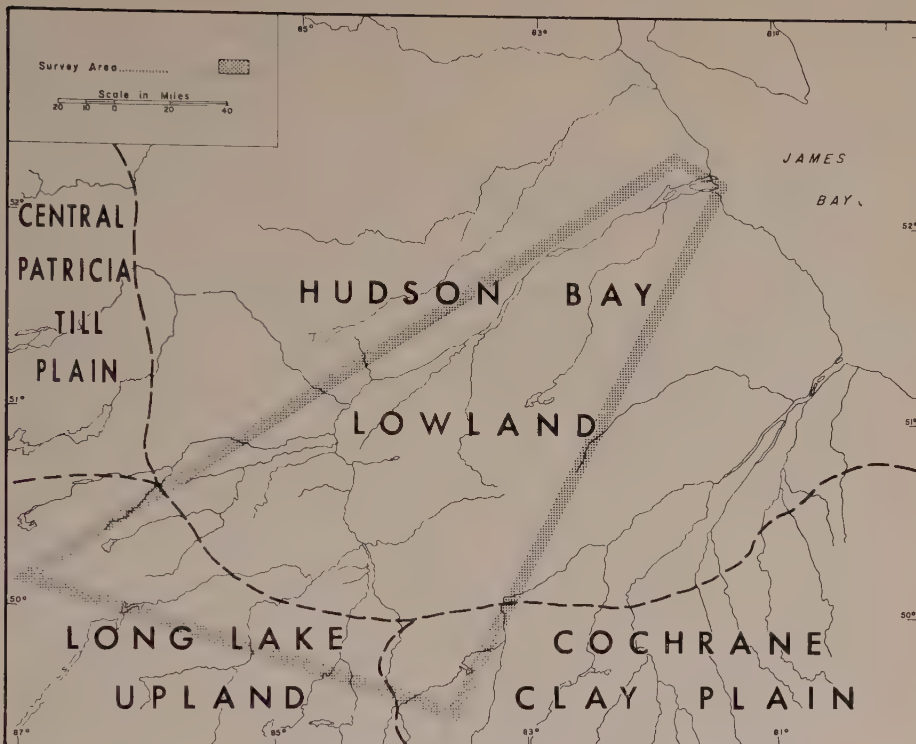

Figure 2. Landform regions of the lower Albany River basin.

often prominent abandoned beach ridges, the drainage of this plain is exceedingly poor. Most of this lowland is covered by muskeg and quaking bog. The forest is largely confined to the alluvium-covered river banks and the higher abandoned beach ridges. The forest is composed of comparatively rich stands of white spruce, black spruce, and boreal deciduous trees in the southern and southwestern sections. These stands along the river banks gradually deteriorate to poor, often dwarfed, black spruce and tamarack forests farther north. The interfluves are muskeg and bog in various stages of transition up to improved vegetal growth. Many of the higher abandoned beaches, such as are found in the vicinity of Kenogami River and its junction with Albany River, support heavy stands of jack pine.

Climatic Conditions

As the area is of generally low relief climatic variations are gradual. Some modifications to a continental regime are felt through the proximity of James Bay to the north, Lake Superior to the southwest and the higher elevations of the height of land to the south. Both James Bay and Lake Superior have the effect of retarding the warmer temperatures of the spring

months and prolonging slightly warmer temperatures into the autumn months. Their influence in midsummer and midwinter, except very locally, appear to be almost negligible. The highland to the south, because of its elevation, produces a 'cold loop' in that area. For example, White River consistently records lower temperatures than the stations to the north. The highland, however, has only a minor influence on the area as a whole. Temperatures vary from an average of about $-5°$ F. in the coolest month and 61° F. in the warmest month. Despite the proximity of Hudson and James Bays, slightly higher temperatures are recorded in July than in August. However, the marine influence can be seen in the late spring and prolonged autumn periods. The October average temperatures are as much as 5° to 10° warmer than those for April. During winter the low temperatures are usually unrelieved by any warm spells with the result that the snowfall, which is less than in any part of southern Ontario, accumulates and persists throughout the entire winter. Precipitation in general varies between 26 to 28 inches, decreasing slightly from the west towards James Bay. Most of this precipitation occurs in the summer months. In the westerly parts of the basin it occurs in July and August, but eastwards of Kapuskasing much of the rain occurs in the late summer and autumn.

Thundershowers are frequent during the summer months and in many areas are almost a daily occurrence. A clear morning and evening with a mid-afternoon thundershower is the general rule.

The following statistical table indicates the climatic conditions of the area.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Station: PAGWA													
Av. temp. (F.°)	0	4	14	32	47	58	62	60	51	39	22	8	33
Total snow (ins.)	15.3	13.4	14.1	10.1	5.2	.84	—	—	0.5	6.8	12.9	14.4	93.1
Total precip. (ins.)	1.57	1.92	1.73	1.68	2.12	3.03	3.04	2.95	2.94	2.50	2.29	1.57	26.84
Station: MOOSE FACTORY													
Av. temp. (F.°)	−6	−3	10	27	41	54	61	59	50	38	21	4	30
Total snow (ins.)	14.2	10.7	11.3	6.3	3.1	0.4	—	—	T	2.5	8.2	12.9	69.6
Total precip. (ins.)	1.42	1.07	1.30	1.15	1.59	1.91	2.29	3.03	2.44	1.78	1.05	1.38	20.47
Station: KAPUSKASING													
Av.temp. (F.°)	−2	2	14	31	46	57	62	60	51	39	22	6	32
Total snow (ins.)	19.6	10.0	13.3	9.3	3.2	T	—	—	0.7	3.6	15.1	16.2	91.0
Total precip. (ins.)	2.00	1.06	1.56	1.82	2.12	2.33	3.43	2.94	3.54	2.50	2.39	1.90	27.59

T = trace.

INDIGENOUS POPULATION

The original inhabitants of northwestern Ontario were the Woodland or Swampy Cree Indians. These Indians, linguistic members of the great Algonkian family of the eastern woodlands of North America, originally

ranged from central Manitoba, through northern Ontario and into central Quebec. Within historic times they were invaded by a minor expansion of the Ojibwas towards the north. This expansion affected only the southern and western borders of the area. The population may still be considered Cree, as only Cree is taught or spoken in the area with the exception of a few Ojibwa words that have found their way into the dialect of the local Cree.

In the lower Albany basin the focal point of the Indians has been Fort Albany at the mouth of Albany River, and it is from this location that the band which makes up the majority of the Indians of the area derives its name. The Albany band at present numbers over 700 (693 in 1949). The greatest concentration of these people is found in the Fort Albany area where more than 400 have settled in the vicinity of the Hudson's Bay Company post and the Anglican mission on the north side of the river, and around a Roman Catholic settlement on the south side. The remaining members of the band are dispersed throughout the area in minor concentrations as far south as Hearst, at Moose Factory, and at various localities along the CNR line. Of these minor concentrations that at Pagwa River is the largest, numbering about 140.

These numbers are not large, but they probably represent close to a peak population for this band. Before the white man came, the limitations of terrain and climate, and a cultural background dependent upon these limitations precluded a dense population. The culture was dependent on the indigenous vegetation and animals, especially the latter, as moose, caribou, beaver, rabbit, and fish provided both food and clothing. Such a culture required an ability to move over wide areas in search of food. The devices evolved to achieve this are well known, the birch-bark canoe for summer travel, and the snow-shoe or toboggan for winter transportation. The toboggan is drawn by dogs hitched 'in line' for bush travel.

The distribution of the Albany band is still largely dependent on their ancient customs, although to an increasing extent the economic attractions of the gradual northward advance of white civilization are drawing many from their traditional occupations, especially the younger members. Despite these attractions, the primary occupation of the majority is still the trapping of fur-bearing animals, an occupation they have been encouraged to pursue ever since the establishment of the Hudson's Bay Company at the mouth of Albany River, and elsewhere throughout the region, during the latter half of the seventeenth century.

The winter period is the trapping and hunting season and lasts from the beginning of October until May. In the summer months the hunters and their families return to the trading posts, spend the revenue derived from their furs and then live on credit granted them by the Hudson's Bay Company.

In the winter hunting season the Albany Cree, like his fellow inhabitants of the eastern woodland, moves into the bush in family groups to run trap lines. He subsists in part off the land and in part on food obtained from the Hudson's Bay Company or independent fur traders. In this area, processed food such as flour, canned goods, vegetables and fruit are recent additions to an otherwise limited diet, which in the past consisted largely of meat supplemented by berries.

The canoes and equipment used to-day are factory produced. The size of canoe and outboard motor depends on the area of the watershed in which the individual's trapline is located. Those using the lower reaches of Albany River or James Bay need 20 to 24-foot cargo canoes. Those travelling in the upper reaches of the Albany and its shallower tributaries use 12- to 18-foot canoes which are easier to pole or to tow in the shallow water and rapids of the smaller rivers, especially in the late summer and fall months when the water level is low.

Nowadays the Indians use shotguns or high-powered rifles, although as late as 1915 muzzle loaders and some flint-locks were still in use. Indeed, prior to the establishment of Revillon Frères Trading Company at Fort Albany in 1907 a gun of any type was a rarity among these Indians, snares and traps being used to obtain game. Rabbit snares and dead-fall traps are still used extensively.

Since the registration of trap lines in 1948, the Indians have been inclined to build a more permanent cabin in or near their lines owing to greater assurance of a constant income from one locality. In former times the winter camp usually consisted entirely of wooden wigwams, and although something of a rarity to-day, a few still use them. The size of these wigwams depend, of course, on the size of the family. Usually they are built of vertically-split spruce logs about 10 feet long, bark-side out, on a conical frame of the traditional wigwam pattern and measure about 15 feet in diameter across the floor. The spaces between the logs are stuffed with moss or turf and the sides banked with snow. An opening left at the apex allows the smoke of fires or portable stoves to escape; a second opening in the side covered with a moose hide or crude wooden door serves as an

Figure 3. A Cree winter wigwam built of spruce logs. Much of the moss cover has fallen away, exposing the interior. Note the snowshoes (left) hung for protection on a tree, and the high wooden platform (right) that serves as a food cache.

Figure 4. A typical Indian sturgeon fishing camp on the floodplain of Albany River. Note the luxuriant forest along the river bank.

entrance. Such a camp is usually situated some distance from the river in thick spruce woods which provide protection from the wind.

The main source of income is the beaver. The annual estimate of beaver under the new fur management system established by the province of Ontario determines the extent of individual trap lines and the number of animals that may be trapped. Marten, otter, muskrat, fisher, mink, fox and lynx are also trapped commercially. Moose, caribou, and rabbit are hunted for domestic use. Seal are often hunted for food on the sea-ice of James Bay by the Indians living at Fort Albany.

At the close of the trapping season, the family and possessions are loaded into a canoe to return to the summer settlement near the trading post. Formerly, the return to the posts was an occasion for a feast. Although feasts are not now as common as in the past the traditional spring festival is still celebrated with square dancing and folk dancing. It is usual at this gathering for treaty money to be paid, elections held, and medical examinations made.

The slow transition from winter to summer is evidenced by the clothing habits of the natives, as parkas and other clothing are usually worn well into the summer months. With the exception of parkas, mocassins, and gauntlets the Indians are entirely dependent on the importation of manufactured clothing. Rubber footwear is considered a necessity and is invariably worn over mocassins which, being of moose skin, are not water-resistant.

Until recent times most of the families returned to the trading posts to spend the summer in relative idleness, the women tending the gill nets, and the men hunting occasionally, or acting as guides. A few occasionally worked at pulp cutting camps or as labourers on local construction work, as for example clearing bush for the Hearst-to-Long Lake highway in 1943, or for the military establishment at Pagwa River in 1951. A few Indians still find employment on the railways.

Following World War II there was an increasing tempo of activity in northern areas. Many of the younger men participated in these activities and moved into pulp cutting camps, sawmills, or into some of the towns. Since 1945 the federal Indian Affairs Branch has been trying to settle Indians at Calstock on the Constance Lake Reserve where they have built homes for them. Pulp cutting is the main activity here, but there is also a small fish packing and wooden box industry. There are nearly 300 Indians, many of them belonging to the Albany band on this reserve.

Another occupation is commercial sturgeon fishing, organized by the federal Indian Affairs Branch in 1951; about thirty families are now sturgeon fishing on Albany River from the forks of the Albany and Kenogami downstream to the Ghost River outpost. The fish caught are taken alive to the Ghost River post and kept until the weekly seaplane arrives to transport them, in ice, to Nakina. From Nakina, the fish are flown directly to the New York market.

In general, the distribution of the Indians of this area tends to be concentrated during the summer and dispersed during the winter months. However, the recent economic growth of the area has led to an increase in opportunities for employment. Because of these, many individuals, and often whole families, each year move from Fort Albany down to Pagwa River, Calstock, and other places adjacent to the railway, or wherever job opportunities arise. Most of the Albany band, however, remain along the rivers and trap beaver which provide the basis of most of their income. Much of the area, especially between the rivers is muskeg, in which a limited number of fur-bearing animals are found. At present few Indians live on the reserves set aside for them by the James Bay Treaty of 1905, as the land is predominantly muskeg. Gardening is possible in this area as has been demonstrated on the farm at the Fort Albany Roman Catholic mission, but no attempt has been made by the natives to provide themselves with vegetables. They prefer to buy canned goods from the Hudson's Bay Company posts or other stores.

Despite every attempt to encourage the Indians to become sedentary, they still remain migratory. Whether trapping or working locally on a temporary basis they still retain much of their ancient culture, and their livelihood is still primarily dependent on trapping. They are, however, in a state of transition. With increasing education and employment opportunities many are abandoning their traditional way of life. The area has been profoundly affected by Europeans and later by Canadian economic developments and technological advances that have taken place since the first discovery and subsequent exploitation of the region. It supports a largely extractive type of economy much as it has done since the early development of the fur-trade, and is dependent mainly on furs, wood-pulp and timber.

ECONOMIC DEVELOPMENT

The development of the area falls into three major periods. The first period was that of exploration and fur-trading. The fur-trade was the only major economic activity until the building of the CPR and the succeeding

railways through northern Ontario during the latter part of the nineteenth and early part of the twentieth centuries. In the early twentieth century a second major period of development began when agricultural settlement and forest industries followed the railways into the various parts of the region. The third period extends from the end of the railroad era in 1932 until the present, a period of slow but progressive development.

The Fur Trade and Use of the Waterways

During the period when fur-trading was the only economic activity (1671-1885) the rivers, especially the Albany, were transportation routes of considerable strategic significance. Until 1820, the history of the fur-trade is one of constant struggle between the conflicting interests of the Hudson's Bay Company and their French competitors. Fort Albany was always one of the most important posts held by the Hudson's Bay Company. As a consequence, the French attacked and destroyed the fort at least three times between 1692 and 1696. Although they met with temporary success in expelling the British and even establishing a trading post (Fort Ste. Anne) at the mouth of the Albany, the Hudson's Bay Company throughout this period maintained occupation by retaining one or more posts in the James Bay region.

Fort Albany, although usually considered secondary in importance to Moose Factory at the mouth of Moose River, was the focus of a fur-trading region that from time to time extended west to Red River, Manitoba, south to the head-waters of the Ottawa, and east into the watersheds of the Rupert, Nottaway, and Harricanaw rivers. The Albany waterway afforded continuous and relatively easy canoe routes for hundreds of miles into the interior, and over the low heights of land to Lake Superior and the west. From this key waterway based on Fort Albany the Hudson's Bay Company was able to outflank the trading route of the French, and later the North West Company, from the western interior to the head of Lake Superior. This advantage frequently enabled the company to outbid the French and to draw the trade of the Indians of the whole upper lakes region to their posts. Further, the Albany River system had the tremendous economic advantage of being an all-canoe route for easier and more rapid transportation of furs to James Bay from whence they could readily be shipped to England. It may well be that this control of the more economic Albany River route was a major factor in the ultimate domination of the Hudson's Bay Company over all of its rivals in this early period.

Throughout this period when furs were the only resource exploited, Albany remained in the same locality, at the mouth of the river, serving as

a focal point for the Indians inhabiting the waterways leading to Albany River. The same is not true of many other posts and outposts erected at various times throughout the area. These shifted from site to site, more or less following the movements of the Indians who, when one area became over-populated and the available game exhausted, moved on to another. The Hudson's Bay Company was flexible enough to move with them.

Before the construction of the railways the rivers were of major importance in exploration and surveys, and in local administration. However, with the completion of the rail net, the building of highways and roads, and the recent extension in the use of aircraft both for travel and survey purposes the rivers have declined as a geographical factor of major importance to the region as a whole. The only two exceptions to this are the continued use of the rivers by Indians engaged in trapping and their use by the pulp and lumber industries for both power and the transportation of logs.

One river route retained its importance until comparatively recent times (1932), namely the Pagwachuan and its continuation down the Kenogami to Albany River. Pagwachuan River flows through the broad depression in the Shield and largely because of this it is the only uninterrupted water route between the CNR northern line and James Bay. Although navigable only in the high water periods of spring and early summer, it is of sufficient volume to carry scows of 15 tons displacement down to the mouth of Albany River. This routé was originally established by the Revillon Frères trading company. In 1916, the company established the Pagwa River settlement, consisting then of a warehouse, trading post and a manager's house, to serve as a water transportation base for their posts at Mammawattawa, Ghost River, and the mouth of Albany River. From Pagwa River each year Revillon Frères sent as many as forty 15-ton scows downstream on the spring-flood in May. These scows, 20 by 40 feet, were built of B.C. fir on the river bank at Pagwa River and broken up for lumber on reaching their destination. When the Hudson's Bay Company assumed control of the Canadian operations of Revillon Frères in 1926 they continued to use the Pagwachuan 'scow-way'. However, with the completion of the Timiskaming and Northern Ontario Railway (Ontario Northland Railway) to Moosonee on James Bay in 1932, the Pagwachuan route fell into comparative disuse. Occasionally, scows are still built and sent downstream; in 1951 two scows, one for the federal Indian Affairs Branch and one for the Hudson's Bay Company, were used on the river route. In the main, the railroads and, to some extent air transportation companies,

have replaced the river freighting activities. Indeed, river travel today, except for occasional tourist or survey parties, consists solely of local trips made by the Indians.

The Railway Era

The second period is that of railroad construction, pulpwood cutting, and agricultural settlement which had a profound influence on the human geography of the area. Not only have these new economic forces brought considerable numbers of white men into the area and into contact with the Indians, but also they have changed the character, although not the nature, of the economy of the region. They have hastened the decline in the relative importance of the fur trade, the primary source of income for the Indians. Moreover, the Indian culture, which until this period had slowly adjusted itself to the material innovations brought in by the fur traders and the spiritual and moral customs of the missionaries, was now faced with new economic and social problems brought about by increasing contact and economic intercourse with the white man. Under the impact of these new forces the Indian culture is undergoing a further change that may lead to its complete integration into Canadian society.

The completion of the CPR line along the north shore of Lake Superior in 1884-85 was the harbinger of this new era. During the first 30 years of the twentieth century the full force of the railroad era had its impact upon the whole of northern Ontario. The newly-discovered clay plain of the Cochrane region was thought to have unlimited possibilities for agricultural settlement and was regarded, especially after viewing the apparent successes of the French-Canadian settlers in the Lake Timiskaming and Abitibi sections, as the greatest potential area for colonization remaining in Canada. As early as 1900 the government of the province of Ontario "determined upon a policy of opening up and exploiting the resources of New Ontario (Northern Ontario) with a view to increasing the industrial wealth and population of the province as a whole"[2]. In that year the provincial government sent ten large survey parties into the region between the CPR line and James Bay to determine which sections "would best repay immediate development, and from what points now accessible by rail, railways or colonization roads should be built to open up the territory for settlement, lumbering and mining"[3].

The railway companies, caught up in the enthusiasm then current, and encouraged by the colonization policies of the Ontario government,

[2] Ontario, Dept. of Crown Lands. "Report of the Survey and Exploration of Northern Ontario, 1900". Toronto, 1901.

[3] loc. cit.

began to extend their lines into "New Ontario" hoping for large profits from the settlers that were expected to flock to the region. Indeed, because of the rugged barrier of the Canadian Shield forming a crescent around the clay plain there was little possibility of its being penetrated by the settler without the aid of the railway.

It was the building of the second Canadian transcontinental railway, the "National Transcontinental" that opened up the 'great clay belt'. This railway was built by the federal Government as the Eastern Division of the Grand Trunk Pacific Railway and was completed through northern Ontario by 1913. Two other railways, the Canadian Northern (CNR since 1918) and the Algoma Central and Hudson Bay railroads were also constructed during this period, and completed through northern Ontario in 1911 and 1913 respectively. The Algoma Central was built to make the western parts of the newly discovered clay belt more accessible to settlers as well as to tap the forest and mineral resources of the region. It terminates at Hearst which was made a divisional point on the Northern Transcontinental (now the CNR Northern Line) in 1914.

These railroads had the desired effect of encouraging settlement and exploiting the forests and minerals of northern Ontario. Settlers moved into the area in large numbers until the depression of the 1930's, and even then the back-to-the-land movement brought in a number of would-be farmers. Pulp and paper companies were also established and sawmills were located in many places, especially where the railroads crossed major rivers.

However, in the area with which this study in concerned, these great developments did not take place except in the southeastern fringe around the town of Hearst. Some Indians were employed as bush cutters during the building of the railways but few of these were from the Albany band. Most of the construction labour was supplied by recent immigrants to Canada. Nevertheless, this development did usher in the modern period in which the railways and the exploitive developments dependent on them brought about a reorientation of the human geography of the lower Albany basin. Fort Albany, as a consequence, declined as the focus of Indian settlement, and Pagwa River grew as a new centre in the area, although Hearst, the largest centre, became the focal centre of the region. Thus the CNR (Northern Line), and the activities and opportunities that arose along it, have had a considerable effect on the Indian population. The railway not only brought the Indian into closer contact with white civilization but also tended to draw numbers of the Indian population into settle-

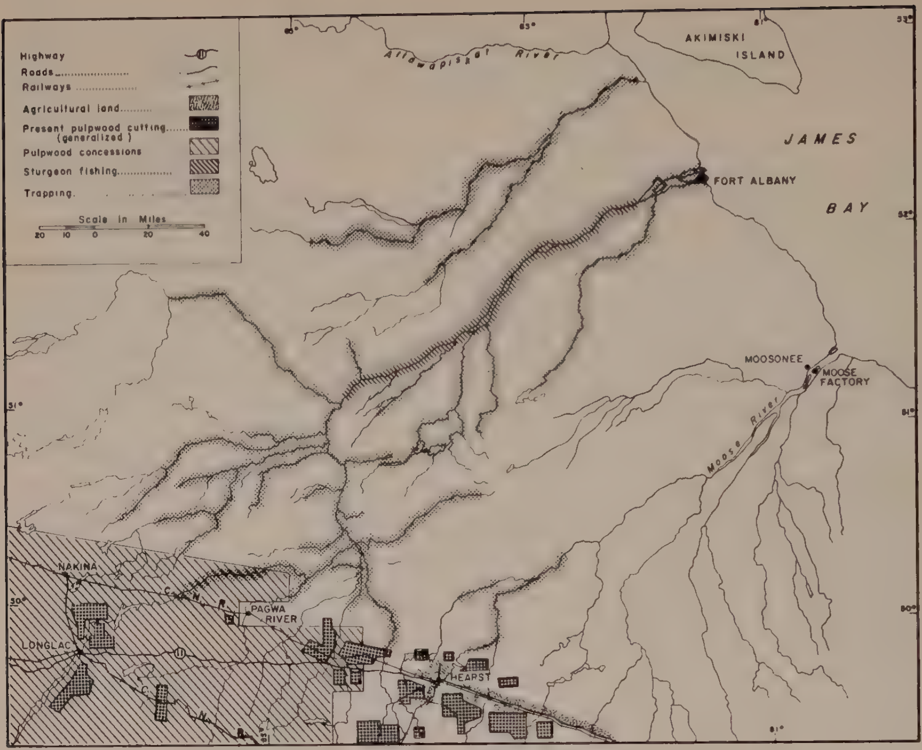

Figure 5. Economic activities in the lower Albany River basin

ments along the right-of-way. The completion of the Timiskaming and Northern Ontario Railroad to Moosonee in 1932 may be considered as the close of the railway period.

Modern Period

Although the area is still dependent upon the railway a new phase of development began in 1932 with the building of a number of airfields and emergency landing strips. This work was undertaken by the Department of National Defence to build a string of airfields and emergency landing strips approximately 100 miles apart across northern Ontario. Small airfields were built at Pagwa River and Nakina, and emergency landing fields at Hearst and Grant. Later, emergency fields were also constructed at Nagogmi and Ogahalla. The maintenance crews and the meteorological observers stationed on these airfields constituted but a slight increase in the population of the area.

Provincial government and commercial airway companies using water-based aircraft now provide transportation facilities throughout the area. Air transport in such a large and difficult area is much more efficient and

usually cheaper than other means of transportation. Its increasing use in aerial surveys of various kinds, in forest inventories and fire fighting are manifestations of the expanding role that air transportation is playing in the development of the area.

World War II brought new prosperity. War-time demands for lumber stimulated sawmill activities in the vicinity of Hearst. The post-war economic boom also encouraged the growth of lumbering. Construction projects and the expansion of the road and highway net also helped to keep the area at a comparatively prosperous economic level. In addition to these, trucking activities and some tourism became of growing importance along the new Trans-Canada Highway. There has been a small but significant population growth with recent migration of French-speaking Canadians into the lumbering camps and construction projects, and recent improvements in agricultural techniques have made agriculture a more profitable enterprise than at any previous time.

SETTLEMENTS

There are two primary types of white settlement within the area; both based on transportation facilities. The older type is at the fur-trading posts, the important settlements being at trans-shipping points between the rivers and the sea. Fort Albany is an example of this type. The newer type of settlement is that based on the railroad, an example being Hearst, a rail centre. Nakina is also a rail centre, being a junction point, but is now also an air centre of considerable local importance. Pagwa River falls midway between these two types, being originally a trading post based on rail facilities.

Fort Albany

Fort Albany was established by the Hudson's Bay Company in 1679 and was the only fort held by the company after the Treaty of Ryswick (1697) until the Treaty of Utrecht in 1713. Save for brief periods of capture by the French it has been in continuous operation since its establishment. Fort Albany was never a large settlement. During the period of the struggle with the French probably a small garrison of labourer-soldiers was maintained, but after 1763 the number of whites diminished. The small garrison was withdrawn and Indians gradually replaced whites as labourers, leaving only a post manager and a clerk or two as the total white population of the post itself. In the twentieth century, with the closing of many of the inland posts the number of white people in the area was even further reduced. There was a temporary increase during the period when Revillon

Frères was established but the numbers were still very small. To-day there is a total population of about 120 around the Hudson's Bay post of whom only five or six are white. According to the chief of the Albany band (1951) there were about 600 Indians at Fort Albany in 1912.

The only other white people, with one or possibly two exceptions, permanently resident in the locality are missionaries. Both the Anglican and Roman Catholic churches are represented at Fort Albany. The Anglicans established a church and school during the latter half of the

Figure 6. Fort Albany eastwards to James Bay. H.B.C. trading post building in centre background. Other houses and tents are Indian dwellings.

nineteenth century. Although Roman Catholic missionaries had been in the area since the French period it was not until well into the second half of the last century that their community was firmly established. Since 1885 the relative number of adherents to each of the churches has remained constant.

In 1925 the Roman Catholic community was moved from its location near the Hudson's Bay Company post on Albany Island to a new site a few miles up the estuary on the south side of the river. Here the settlement occupies over 100 acres on the mainland and 70 acres on Sinclair Island. The mainland settlement consists of a farm, a rectory, a ten-bed hospital and nunnery, and a boarding-school for Indian children. Three priests, twenty brothers and about twenty nuns live on this site. On the island

Figure 7. Settlement pattern of Hearst.

surrounding a large church is the Roman Catholic Indian village consisting of small wooden houses and shacks, with a population of about 220.

Hearst

Hearst (1951 population, 1,723) began as a collection of contractors' shacks and bunk houses put up in 1912 during the building of the Transcontinental Railway. Its location was at the junction point of the Transcontinental and the Algoma Central and Hudson Bay Railway (completed in 1913). By 1914, Hearst was established as a divisional point and its future as a focal point on the railroads was assured. In the same year divisional yards, roundhouse, and other railway buildings were completed. Services grew up to supply the resident railroad population and Hearst became established as the western capital of the clay belt. During World War I Hearst expanded as a sawmill and lumber trans-shipping centre, and to-day still retains this locally important industry as one of its primary functions.

With the growth of agricultural settlement in the clay belt, Hearst, situated near the western end of the clay plain, developed as the western limit of the farming communities that slowly pushed westward along the railway line from the Cochrane area. Accordingly it now serves as the local collection and distribution centre for the surrounding agricultural population, which numbers about 4,000 within the economic sphere of influence of Hearst. The town is also a supply centre for the Indians to the north and west.

In the 1930's a highway was completed from Cochrane to Hearst, and this encouraged both agricultural settlement and the pulp-cutting industry. Provincial highway No. 11 was completed from Hearst to Fort William in 1943 placing Hearst on the Trans-Canada Highway. The town has enjoyed a minor boom because of the highway as it is now an important stopping-point for truckers and motorists passing through the area.

The primary function of Hearst remains that of trans-shipping as it is now connected with both the railways and the highway. Lumber and pulpwood are the major products of the surrounding area and are likely to remain so for some time to come. Many of the large pulp and paper companies maintain offices in the town.

The town itself is laid out in the traditional grid pattern and in the main lies between the railroad tracks to the north and Mattawishkwia River to the south. The river is used for water supply and sewage disposal. The commercial section lies along the highway and the first street (George St.)

is parallel to it, and also serves the highway traffic. The large number of hotels, rooming houses, and restaurants indicate that much of the population is of a transient character, seasonly employed in the forest industries. However, many of the workers in the forest industries make Hearst their off-season home. Large hardware, feed, general stores, and banks serve the surrounding agricultural population. The recent growth of a number of large gasoline stations indicates the growing importance of the highway.

Of further importance to the town is a large Roman Catholic settlement on the southern side. This settlement consists of a school, nunnery, large church and rectory as well as playground facilities. Hearst also supports a high school and large arena, both indicating the local importance and permanency of the town despite the transient character of much of its business and some of its population.

Pagwa River

Although it remains primarily a trading-post, the Pagwa River base has become an important, and seemingly permanent, Indian settlement. Its population was 140 in 1951, compared with 9 in 1941. A church and a number of wooden houses have been built on the right bank of Pagwachuan River. In addition to the Hudson's Bay Company store and a general store run by an independent fur-trader it also has the only public school between Hearst and Nakina. Indian children come from many miles around to attend the school here. A further addition to the population is that of the federal Department of Transport, radio, meteorological, and maintenance staffs of nearby Pagwa airport. A larger, probably permanent, settlement has been growing at Pagwa River in recent years with the nearby construction of a military establishment.

Nakina

Nakina (approximate population, 500) is the only other large community of whites within the lower Albany basin. Like Hearst it is also a railway division point and a junction. Just east of Nakina is the main rail connection southward to Long Lake where the main line from Nipigon to Sudbury is joined. Nakina is a typical northland town based mainly on its rail activities and in more recent years on the airport facilities nearby. Although the main business centre for the town is Long Lake there are stores and other facilities in Nakina.

The only other settlement of any size within the area is that at Calstock with a population of 120*. Calstock is in the Constance Lake Indian

* 1951 Census of Canada.

reserve and here a number of the Constance Lake band, which totals about 250 members, have settled in government housing and are employed mainly as pulpwood cutters.

CONCLUSION

Development potentialities in the lower Albany area are limited for agriculture by the poor soils, drainage, and climate, and for pulpwood by muskeg and the increasingly smaller stands of merchantable timber to the north. Further economic development is likely to take place only under stimulus from outside the area.

The most important economic activity is pulpwood cutting. Pulpwood concessions cover most of the area west of Kabinakagami River and south of the latitude of the forks of Kenogami and Pagwachuan Rivers (Figure 5). These concessions are held by two large companies, with a dozen or more smaller operators cutting pulpwood and timber within a 30-mile radius of Hearst. All the extensive stands of pulpwood are under concession, especially to the west of Hearst, and there is little likelihood of further expansion of these concessions except locally, because north of the present limits the spruce stands deteriorate rapidly into extensive open muskegs, the only good timber being the mixed stands of deciduous and coniferous trees extending in narrow bands along the river banks.

In 1951 twelve sawmills operated in the Hearst area including one in the town itself. Many of these were small and served only local markets, but the increase in the number of mills from only two in 1944 attests to the increasing importance of timber to the area as well as to the recent growth of the whole region.

Agricultural settlement, except for a few squatters with small vegetable gardens along the CNR track between Hearst and Pagwa River, is restricted to the immediate vicinity of Hearst, and settlement in this area has progressed slowly because of the difficulties in making a farm economically feasible under the adverse market and environmental conditions of the area. Most of the present agricultural settlement lies close to the developed roads and the railways in a ribbon-like pattern with a number of minor nucleii along it, chiefly because of the transportation facilities and in part because of adverse land conditions to the north and south of Hearst. To the north there is increasingly poor drainage with, as a consequence, extremely wet bog soils and muskeg vegetation. This prevents expansion northwards not only because of the difficult and infertile soils, but also because of the

inferiority of the timber which is not merchantable. Merchantable timber is a prime requisite of newly established farmsites in the clay belt as it provides an additional and necessary source of income. To the south of Hearst extensive tracts of thin, rocky, and sandy soils preclude successful settlement in this section except within 8 to 10 miles of the town. Expansion to the west is stopped by pulpwood concessions and the gradual disappearance of the clay plain. Future expansion is likely to remain relatively slow, at least until all of the better lands to the east are taken up.

The development of tourism and an expansion of the present sporadic hunting and fishing activities may be increased. However, the nature of the country, with its lack of natural beauty is not conducive to the development of a resort or tourist business. The almost flat terrain, the interminable ragged-looking spruce forest, few and marshy lakes and muskegs are not attractive to tourists. Most of the timbered sections being under concession, the pulp companies discourage tourism and the use of their roads and trails because of fire hazard.

The two major economic activities in the lower Albany basin are forestry and farming. Fur-trapping is principally a subsistence occupation for the Indians and is not of major economic importance. In forestry and farming most of the recent growth has been an expansion of the forestry activities. Because of the general policy of sustained yield from the pulpwood concessions, there is little likelihood of much expansion of pulp and paper mills within the region. In the forest-farm system, farm income must be supplemented by income from merchantable timber. This system normally encourages the farmer to depend on woods operations and tends to maintain marginal farming. These factors will no doubt limit population expansion in the rural areas. Thus, except for defence projects or other imported economic stimuli, it is probable that population growth will proceed but slowly, with most of the increment stemming from local natural increase.

RÉSUMÉ

La région étudiée ici est située dans le nord de l'Ontario et comprend une partie du bassin de la rivière Albany inférieure; elle s'étend de la voie du National-Canadien, entre Hearst et Nakina, à Fort Albany sur la baie James.

L'auteur relève les grands traits de la géographie physique de cette région triangulaire, faisant ressortir les influences que le milieu a pu avoir sur le comportement des indigènes et des blancs. Il explique aussi l'effet

qu'a eu sur la colonisation par les blancs la construction du chemin de fer dans cette partie du pays au début du siècle.

Le relief du bassin de la rivière Albany inférieure ressemble à celui d'une plaine, avec élévations maximums de 800 pieds. La nature du terrain, toutefois, se divise en trois classes différentes: les hautes terres du lac Long, la plaine argileuse de Cochrane et les basse terres de la baie d'Hudson. Partout, le sol est recouvert d'apports des glaciers dont l'épaisseur varie; les sols pauvres et les conditions climatiques peu favorables sont à l'origine des fondrières et d'essences forestières tels que l'épinette noire, l'épinette blanche, le pin gris et le mélèze laricin, tous de qualité variable.

La plupart des indigènes, au nombre de 700, sont des indiens Cree du groupe Albany. Malgré l'attrait économique de la civilisation, leurs principales occupations sont encore la chasse, le piégeage et la pêche. Ils obtiennent la plus grande partie de leur nourriture et de leurs vêtements en échange de leurs fourrures aux postes de traite.

La récente expansion écomonique de la région, cependant, a fait augmenter les possibilités d'emploi et chaque année plusieurs familles d'indigènes émigrent à des endroits situés à proximité de la voie du National-Canadien.

ICE CONDITIONS: GULF OF ST. LAWRENCE, 1956

*W. A. Black**

Ice conditions were observed at regular intervals between February 11 and March 6. During this period ten flights were undertaken, originating at Greenwood, N.S. and extending westward to Saguenay River, eastward to the Strait of Belle Isle and southward to Cabot Strait. In general, the aircraft were flown at 1,000 feet elevation and the flight patterns varied in order to obtain the broadest possible coverage. The area that came under most frequent observation included the western, central and southern parts of the Gulf where there was the greatest concentration of ice. This area also provided the most frequent variation in the distribution of ice and varied considerably from one flight to another.

Generally, the overall ice concentration observed during the reconnaissance was light. The shipping track through the Gulf was relatively free except for scattered bands of brash. Along the north shore of the St. Lawrence estuary and Gulf of St. Lawrence the ice varied in width from a fraction of a mile to more than 10 miles. On the north shore ice extended southward of a line connecting St. Paul Island and Cape Gaspé. Wherever observed, harbours were filled with land-fast ice. In the areas of ice accumulation the surface coverage consisted chiefly of young ice. Except for the land-fast winter ice in protected bays and harbours the heaviest concentration of winter ice occurred in the Strait of Belle Isle. Patches of winter ice occurred in the western end of Northumberland Strait and in the Gulf off Cape Breton Island. All of these areas also contained a considerable proportion of young ice and open water. Offshore winds frequently opened leads along the coasts and the reformation of ice types was delayed considerably by an unusually mild winter. Under the influence of strong northwesterly winds strings and bands of brash from the St. Lawrence estuary and from the Gulf of St. Lawrence funnelled southeastward into Cabot Strait.

The following photographs illustrate the types of ice, their local distribution and their development as observed during the winter flights.

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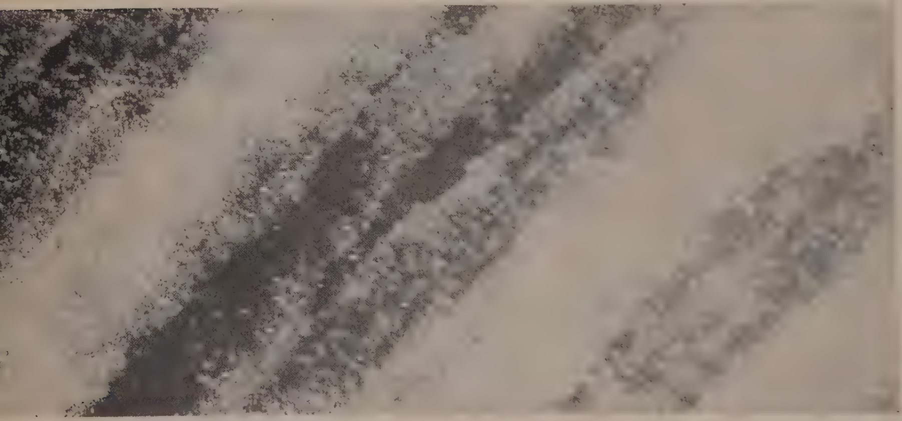
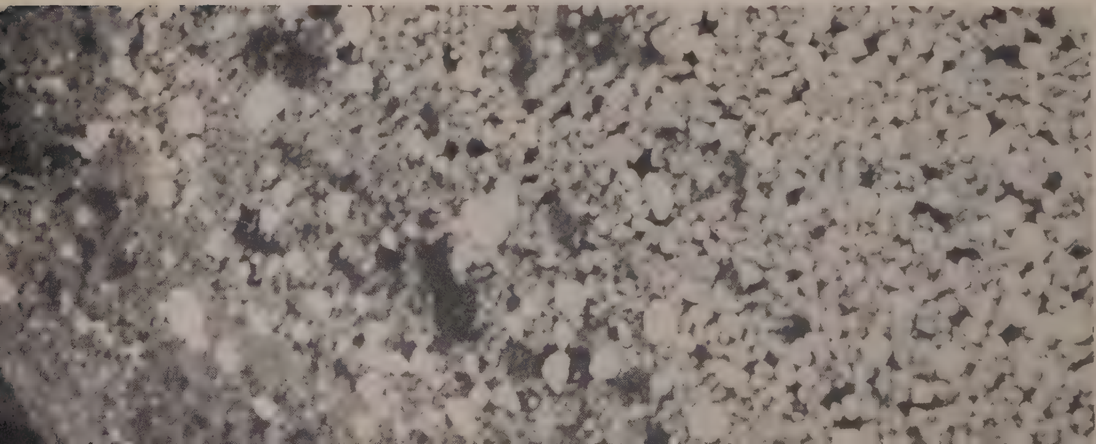
* W. A. Black of the Geographical Branch was an observer on a series of winter flights over the Gulf of St. Lawrence during February—March, 1956. The project was organized by the Royal Canadian Navy in cooperation with the Defence Research Board.

The shatter-pattern shows that the ice is rapidly disintegrating. In detail the shatter edges are smooth and rounded and are indicative of soft ice which is being reduced to brash.

Bands of brash parallel the direction of the wind, the force of which has produced a pronounced banding pattern. In detail, the pieces of ice are uniformly small, resulting from the ice having consolidated, and under the impact of a rough sea and high surface winds, shattered evenly throughout the parent ice sheet.

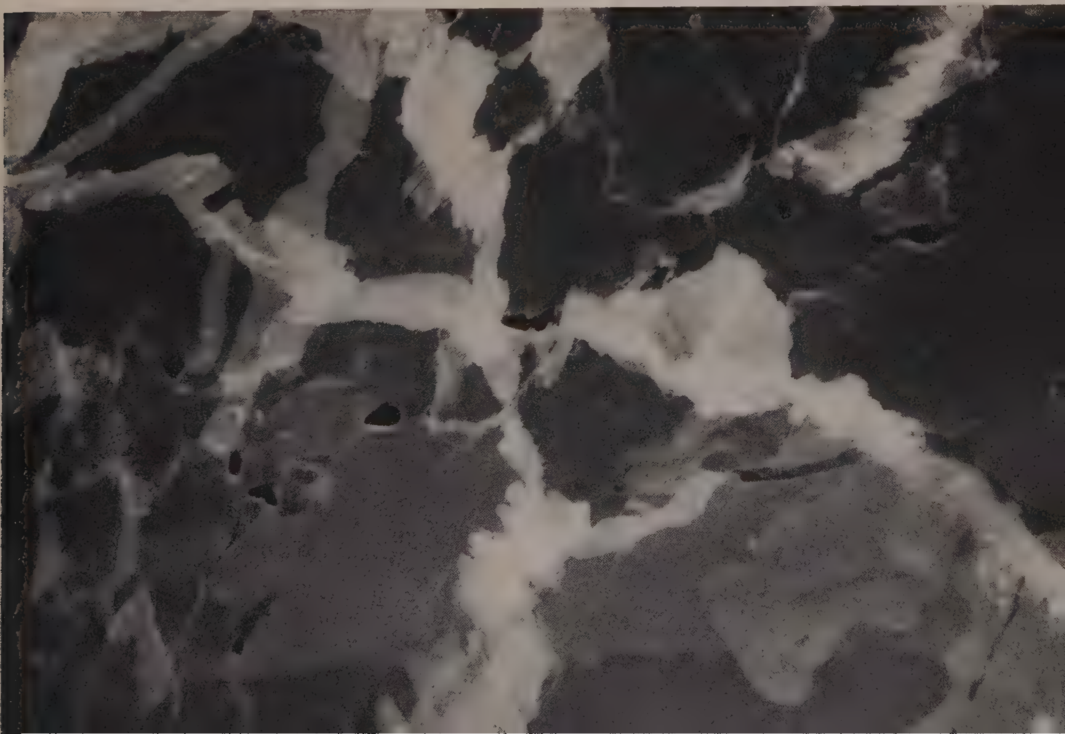


The angular blocks of brash measure approximately 5 feet across. This is part of a band that has been driven into a pack by the force of strong winds. From the angularity, size, and colour of the blocks, consolidation to winter ice appears to be well advanced.

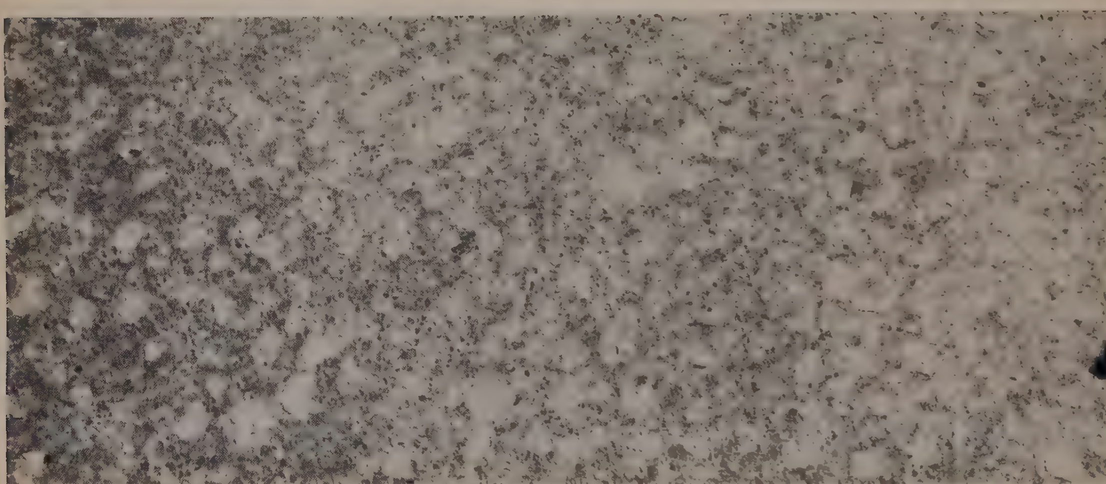


Newly-formed young ice is level, grey in colour, and transparent; wherever snow is incorporated in young ice it produces a matted appearance; the dark patches are water spaces. Concentration of ice in this area exceeds nine-tenths. The ice at this stage of development has attained sufficient rigidity to raft under pressure exerted by a rising sea swell.

Over-lapping or rafting of young ice (white areas) has extended 20 to 40 feet over the underlying ice (dark areas). The raftings are sharp and angular. This form of accumulation adds rapidly to the thickness of an ice-floe. Approximately 25 per cent of the ice shown is rafted.



A band of brash extends to the horizon. Curved horns, smooth outlines of spits, bays and bights are characteristic outlines when a mass of ice is driven forward by a strong surface wind.



A heavy concentration of brash bonded together with sludge; the latter forms a thick soupy mass; the ice surface is rough and ragged. Consolidation of this mass results in heavy winter ice.

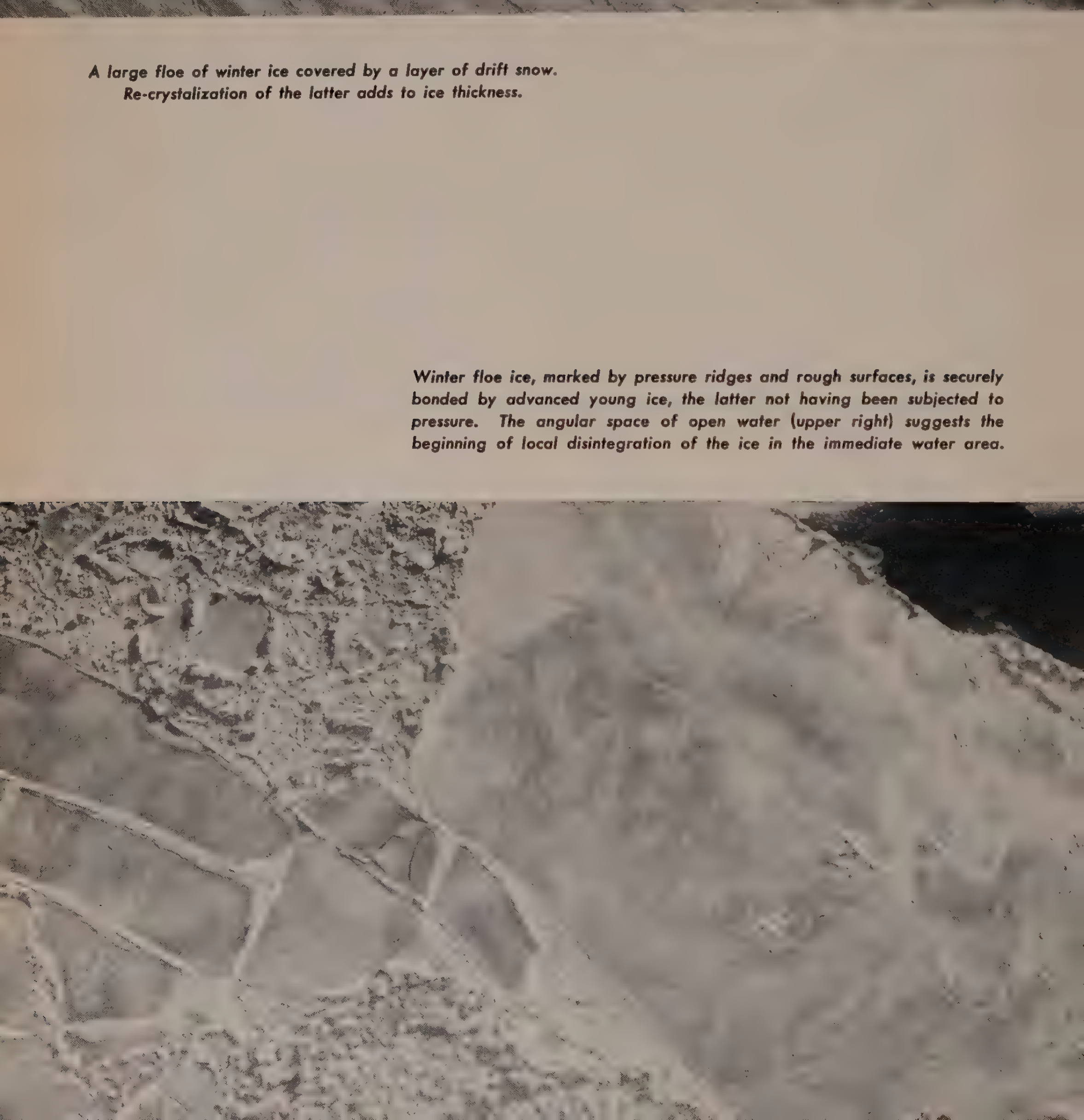
A large area of winter ice formed by the compaction of brash, small floes and sludge. The angular outline of the cracks indicates that the ice has consolidated firmly into winter ice. The surface is rough, and pressure ridges are evident (top).

At least two intervals of consolidation and two intervals of shattering are evident in the surface patterns of the small floes. The processes of consolidation are frequently interrupted by the forces of destruction. The brash edge in the upper left is sharp in outline as the ice is held in place by strong surface winds.

The ice surface, composed of floes of young ice bonded together by very young ice, is now disintegrating. This is evident in the rafting of ice, the separation of floes, and the angular appearance of water openings. The sharp edge along the ship's track is characteristic of this type of ice.

A large floe of winter ice covered by a layer of drift snow. Re-crystalization of the latter adds to ice thickness.

Winter floe ice, marked by pressure ridges and rough surfaces, is securely bonded by advanced young ice, the latter not having been subjected to pressure. The angular space of open water (upper right) suggests the beginning of local disintegration of the ice in the immediate water area.



The surfaces of the winter floe ice are marked by pressure ridges or drift snow. The ice has been subjected to disruptive strains evidenced by the various orientations of individual floes and by the jagged pattern of the cracks.

Large floes of winter ice are detached from the main ice field. The differences in detail of the surface floes arise chiefly from different formative processes. The ice (left foreground) has been subjected to pressure; the sheet (foreground) appears as level ice that has not been subjected to the same pressure.

MAP NOTES

CANADA, Points Served by Civil Air Lines, November 1955. 1:6,750,000. Canada, Dept. of Mines and Technical Surveys, Geographical Branch, Ottawa, 1956.

Based on the latest available information, this map shows both scheduled and non-scheduled routes of domestic and foreign air lines serving Canada.

AGRICULTURAL REGIONS OF CANADA. 1:3,500,000. Canada, Dept. of Mines and Technical Surveys, Geographical Branch, Ottawa, 1956.

This map is in two sections, one for eastern and one for western Canada. The legend indicates the dominant type of farming within each agricultural region by means of symbols. An inset gives the name of the agricultural region within each province from numbers on the face of the map. There is also a table showing the generalized distribution of agricultural regions by province.

CANADA, South of Latitude 75° Showing Condition of Geodetic Operations at End of Year 1955. 1:6,336,000. Canada, Dept. of Mines and Technical Surveys, Surveys and Mapping Branch, Geodetic Survey, Ottawa, 1956.

This latest published map shows both reconnaissance and completed triangulation, areas of both precise traverse and precise levelling as well as points of precise and exploratory astronomical fixation and tidal stations.

H-ISODYNAMIC CHART, Canada, 1955.0; Lines of Equal Horizontal Magnetic Intensity and Equal Annual Change. 1:6,336,000. Canada, Dept. of Mines and Technical Surveys, Dominion Observatories Branch, Ottawa, 1955.

Isodynes denoting the average horizontal intensity in gammas of the geomagnetic field are indicated by means of red lines, while isopors denoting the annual change in the horizontal intensity in gammas are indicated by blue lines.

ISOGONIC CHART, Canada, 1955.0; Lines of Equal Magnetic Declination and Equal Annual Change. 1:6,336,000. Canada, Dept. of Mines and Technical Surveys, Dominion Observatories Branch, Ottawa, 1955.

Isogones denoting the average declination or variation of the compass in degrees are indicated by means of red lines. The agonic line is indicated by means of a double red line. Isopors denoting the annual change of declination in minutes of arc are indicated by blue lines.

Province de Québec. 1:1,267,200. Québec, Dept. des Terres et Forêts, Québec, 1956. (Deux feuillets).

C'est l'édition la plus récente de la carte de la province de Québec. Imprimée en huit couleurs, cette carte montre tous les comtés ainsi que leurs subdivisions administratives. Le réseau ferroviaire et le réseau routier sont représentés, le premier en noir, le second en rouge, accompagné du numéro officiel pour chacune des principales routes de la province. Un relevé plus élaboré du réseau hydrographique des régions septentrionales a été effectué et nombre de lacs et rivières omis dans les éditions précédentes sont maintenant représentés. Notons qu'en plus d'être imprimée sur papier comme à l'accoutumée, cette carte a également été reproduite sur un matériel plastique, ayant pour effet de la rendre plus durable, tout en améliorant considérablement son apparence.

[E.L.B.]

BOOK NOTES

Bibliographie Géographique Internationale, 1951, 1952, 1953. France, Association des Géographes Français et de l'Union Géographique Internationale avec le concours de l'UNESCO et du Centre National de la Recherche Scientifique. Librairie Armand Colin, Paris, 1956. 1004 pp.

This 60th issue of the *Bibliographie Géographique Internationale* is a comprehensive listing of books, periodicals, and articles published throughout the world on geography and related fields during the period 1951-1953. It is a companion work to the *Bibliographie Cartographique Internationale*, a bibliography of maps. The compilation of the many thousands of entries in both publications has been done by the Association of French Geographers with the assistance of geographical societies in many countries.

The bibliography is divided into two parts—systematic and regional. Entries in Part A (systematic) are sub-divided into many sections including historic, cartographic, geophysic, meteorologic, hydrographic, oceanographic, and biogeographic sections. Entries in Part B (regional) are sub-divided by countries. Many of the listings are accompanied by short descriptive notes, some of them signed by geographers who are specialists in the field or country with which the listing is concerned.

(V.W.S.)

Bibliographie Cartographique Internationale. France, Comité National Français de Géographie et de l'Union Géographique Internationale avec le concours de l'UNESCO et du Centre National de la Recherche Scientifique. Paris, Armand Colin, 1949. 3369 pp.

The aim of this work is implied in its title. It is an attempt to bring together in one annual publication the cartographical production, official and commercial, of as many countries as possible. The forerunner of the bibliography was a national list of maps compiled by a group of French geographers and published in 1937 under the title "Bibliographie cartographique française". The initiative was approved by the International Geographical Congress at Amsterdam in 1938, and the hope expressed that the work might become international in character. The French lists were continued to 1945 when, with the support of the I.G.U. and the French National Committee for Geography, the first international list was begun. The "Bibliographie cartographique internationale 1946-47" was published in 1949 and edited by Mlle. M. Foncin, Conservateur du Département des Cartes, Bibliothèque Nationale, and Mme. P. Sommer, Bibliothécaire de l'Institut de Géographie.

Canada began an annual contribution to the project during the second year of its compilation, by when, twelve countries were participating. The latest edition (1954) lists 21 countries as participants. The main division of the information is by political units with the subdivisions—general surveys, special maps, regional maps and plans. New editions of existing series are included and in many cases analytical notes are added.

[E.L.B.]

Canadian Maps 1949 to 1954, Canada, Dept. of Mines and Tech. Surv., Geog. Br., Biblio. Ser. No. 16, Ottawa, 1956, 82 p.

To date, apart from Canada's annual contribution to the *Bibliographie Cartographique Internationale*, there has been no published bibliography of Canadian maps.

The present volume is a cumulation for the period 1949 to 1954 inclusive, and is divided into two parts. Part I is a selected bibliography of maps of Canada, its provinces and territories, published by the federal and provincial governments and other agencies. Part II is a comprehensive list of map sheets of the various federal topographical series either published for the first time or revised during the period. It is planned to continue the issue of cumulative bibliographies of Canadian maps from time to time.

The present volume and those to follow will be invaluable bibliographic aids to governmental departments, to universities and to other institutions and individuals whose research includes the use of maps.
[F.A.C.]

Canadian Geophysical Bulletin. Canada, National Research Council, Associate Committee on Geodesy and Geophysics, Vol. 8, Ottawa, 1955. 64 pp. biblio.

The purpose of this bulletin is to "present a summary and bibliography of geophysical activity in Canada up to the end of 1955". The material contained in the bulletin is drawn from reports prepared by chairmen of research sections of the Associate Committee on Geodesy and Geophysics. Summaries of research conducted by government agencies, universities, and mining corporations are discussed. Accounts of progress in the fields of geodesy, seismology, meteorology, oceanography, and mining geophysics are included.
[V.W.S.]

Research on Immigrant Adjustment and Ethnic Groups, A Bibliography of Published Material, 1920-1953. Canada, Dept. of Citizenship and Immigration, Can. Citizenship Br., Ottawa, February, 1956, 131 pp.

The Canadian Citizenship Branch has assembled a valuable bibliography of published research material dealing with immigration, citizenship, and the adjustment of ethnic groups in Canada. The bibliography is divided into 23 sections each of which deals with one ethnic group. A final section is devoted to books and articles of general application in the field. A brief critical comment or short abstract is included for many of the entries, totalling more than 450.
[V.W.S.]

A Graphic Presentation of Agriculture, 1951 Census. Canada, Dept. of Trade and Commerce, Dominion Bureau of Statistics, Census Div., Ottawa, 1956, 18 pp. maps, graphs. Price 25 cents.

The maps and graphs contained in this paper show various aspects of agriculture in Canada. Distribution maps show generalized types of farming, average value of farm products, crop acreages, and livestock. The elements of farm population, average size of farms, and utilization of farm land are represented by graphic maps.

The maps based on data published in the 1951 Census were prepared in collaboration with the Economics Division of the Department of Agriculture. Text and map legends are in English and French.
[J.I.D.]

The Climate of Central Canada. By W. G. Kendrew and B. W. Currie. Canada, Dept. of Transport, Met. Div., Toronto, 1955, 194 pp., maps, tables, illus. Price $1.00.

The authors of this publication are well-known to the professional climatologist, geographer, ecologist, and others interested in regional climatology. Indeed, so too are the initial reports on the various regional divisions in central Canada from which this book was prepared. In this work, however, a valuable service has been performed by bringing together much scattered, and in many ways too detailed data, and in synthesizing and condensing them in a comprehensive and satisfactory manner.

The book is divided into six chapters. Chapter 1 is concerned with the general climatic features of the regions as a whole with emphasis on the physical controls that determine some of the important elements. The remaining five chapters comprise a regional discussion of the Mackenzie Basin, the Barren Grounds, the Forest and Parkland areas of Alberta and Saskatchewan, the Prairie Grasslands, and Manitoba, the five climatic regional divisions into which central Canada has been divided. Much material regarding the influence of the climate on life, plant, animal and human, has been included.
[F.A.C.]

ONTARIO RESOURCES ATLAS. Dept. of Lands and Forests, Toronto. 34 maps. Price $1.00.

The information presented in this atlas will be of interest to a wide range of people in governmental, academic and business fields as it is of general interest and also useful general source material for those working on the geography of Ontario. It is a continuation and expansion of the "Ontario Forest Atlas" published soon after the Second World War with maps dated 1941 and 1944. The information has been brought up to-date (May, 1954) and new reference maps have been added, considerably broadening the scope of the earlier publication. In addition to maps of forest conditions, there are maps of industrial development, administrative organization, and various reference maps, including seven maps on the distribution of wildlife, a land use map, and maps showing land areas open for settlement, forest resources inventory, and soil materials. The additional maps are of considerable use and have improved this continually growing and increasingly useful atlas of Ontario.

[W.G.D.]

BLACK CREEK PLAN. Ontario Dept. of Planning and Development, Conservation Br., Toronto, 1956, 50 pp., tables, maps.

A comprehensive study of the watershed of Black Creek, one of the tributaries of Credit River, was carried out for the purpose of encouraging the farmers and landowners in the valley to participate in a complete conservation program. Extensive field work provided the basic data for a detailed examination of soils, land use, and land capability. Geology and soils were mapped first and the degree of soil erosion was determined. Then the present land use was mapped and land capability and recommended land use indicated. Finally, a discussion of advisable conservation measures to be applied in the area includes such practices as contour cultivation, improved pasture, crop rotations, artificial drainage, woodland management, and stone removal. The manner in which this conservation program should be instituted is explained in the final chapter. The report includes seven tables and two multicoloured maps.

[C.N.F.]

GREAT LAKES PILOT. Canada, Dept. of Mines and Tech. Surveys, Surveys and Mapping Br., Cdn. Hydrographic Serv., Vol. 2, Ottawa, 1955, 538 pp., map. Price $3.50.

Volume 2 of the Great Lakes Pilot, the first Canadian edition, is concerned with Lake Huron, Georgian Bay and the Canadian shores of Lake Superior. The introductory sections include information on lights, buoys, signal systems, marine services, and weather and ice conditions. There are tables showing distances between points in the Great Lakes and tables of annual maximum and minimum water surface levels in Lake Huron and Lake Superior for the years 1860 to 1954. The main body of the text gives detailed sailing directions and additional information on navigational aids and harbour facilities.

[C.N.F.]

REPORT OF THE ROYAL COMMISSION ON THE METROPOLITAN DEVELOPMENT OF CALGARY AND EDMONTON. Queen's Printer, Edmonton, January, 1956, 586 pp., maps, tables. Price $6.50.

Calgary and Edmonton are the two fastest growing metropolitan areas in Canada. Between 1941 and 1951 their populations increased by 77 per cent and 49 per cent respectively. The problems presented by this rapid growth prompted the Alberta Legislature to appoint a Royal Commission to inquire into all aspects of urban development and to make recommendations that will ensure an "equitable distribution of costs and the orderly development of the areas".

Chapters are devoted to population growth in the two cities, descriptions of fringe communities, finances, forms of government, the impact of oil and natural gas on the economy, and industrial development, to name only a few. Recommendations are included in each chapter and a brief summary of these recommendations is contained in the concluding chapter. This exhaustive document will be a valuable blueprint for city planners in the two cities concerned.

(V.W.S.]

Geological Reconnaissance—Prince Patrick, Eglinton, and Western Melville Islands, Arctic Archipelago, Northwest Territories. By E. T. Tozer. Canada, Dept. of Mines and Technical Surveys, Geol. Surv., Canada, Paper 55-5, Ottawa, 1955. 32 pp. maps, illus. Price 50 cents.

Following a brief outline of the history of exploration and a description of the natural environment, there is an account of the physical features of Prince Patrick, Eglinton and Western Melville islands, and a discussion of the effects of glaciation. The main body of the text is concerned with a detailed account of the stratigraphy and the structural geology of the islands. The report is accompanied by tables of formations, columnar sections, and a geological map of the region. The map is in colour and has a scale of 1″ to 8 miles.

[S.S.B.]

A Preliminary Report on some of the Oceanographic Features of Foxe Basin 1955. By N. J. Campbell and A. E. Collin. Joint Committee on Oceanography, Atlantic Oceanographic Group. St. Andrews, 1956, 42 pp., maps, graphs, mimeo.

During the period from July to November 1955 the icebreaker H.M.C.S. Labrador carried out an extensive operational program in Hudson Strait and Foxe Basin. Oceanographic investigations were carried out with the aim of studying both the synoptic and dynamic characteristics of the region. The preliminary report contains the results of this investigation. Data was collected on ice conditions, seasonal variations of temperature, salinity, and oxygen, distribution of temperature and salinity, and the circulation of Foxe Basin. The text is well supported with maps of the various distributions and an extensive bibliography is included.

[C.N.F.]

Notes on Sea Ice Observed from C.G.S. D'Iberville and C. D. Howe, August 13–October 12, 1955. By Moira Dunbar. Canada, Department of National Defence, Defence Research Board. Arctic Report No. 4/55. Ottawa, 1956. 3 pp., 4 maps.

The sea ice conditions observed during this period are described in the notes and are shown on the accompanying maps. The areas observed are Lancaster and Jones Sounds, Norwegian Bay and Foxe Basin.

[W.A.B.]

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